United States Department of the Interior
Bureau of Land Management

Bureau of Land Management

Preliminary
Environmental Assessment

DOI-BLM-CO-SO50-2014-0037 EA

North Delta Grazing Permit Renewals

Location: BLM Public Lands North of Delta, Colorado

U.S. Department of the Interior
Bureau of Land Management
Uncompahgre Field Office
2465 South Townsend Avenue
Montrose, CO 81401
Phone: (970) 240-5300

BLM

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

U.S. Department of the Interior
Bureau of Land Management
Uncompahgre Field Office
2465 South Townsend Avenue
Montrose, CO 81401

ENVIRONMENTAL ASSESSMENT

NUMBER: DOI-BLM-CO-S050-2014-0037 EA

PROJECT NAME: North Delta Grazing Permit Renewals

PLANNING UNIT: North Delta, Escalante, and Gunnison Gorge Land Health Units

LEGAL DESCRIPTION FOR DETAILED ANALYSIS AREA:
T4S, R3E, Ute Meridian, several sections.
T15S, R97W; T15S, R96W; T15S, R95W; T14S, R97W; T14S, R98W; T14S, R96W; T14S, R95W; T13S, R95W; T13S, R96W all in the 6th Principal Meridian, many sections.

APPLICANT: Grazing Term Permit Holders/BLM

BACKGROUND/INTRODUCTION

This Environmental Assessment will analyze the impacts of issuing permits for livestock grazing on public land managed by the BLM. Permits will include terms and conditions that improve or maintain public land health. The public will benefit from lands which are maintained in a healthy condition and that provide sustainable resources for a variety of uses.

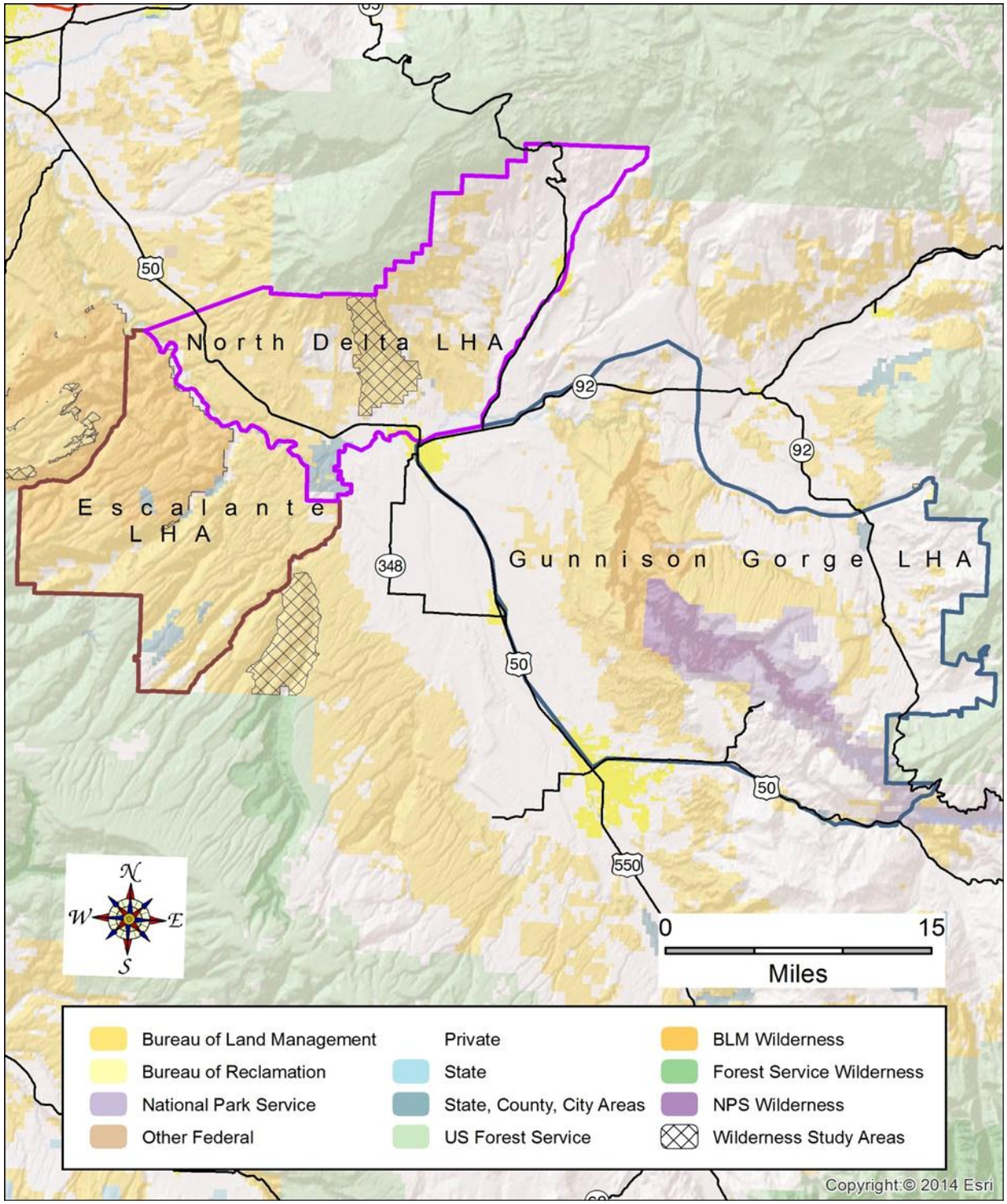
This action is part of a plan to apply the "Colorado Standards for Public Land Health" and "Guidelines for Livestock Grazing Management" to the grazing permit renewal process. The analysis includes an evaluation of whether or not an allotment, or a portion thereof, is meeting, meeting with problems (which is reported as meeting), or not meeting the five standards for landscape health identified in the Uncompahgre Basin Resource Management Plan and Record of Decision; amended March 1997 to include the Colorado Standards for Public Land Health and Guidelines for Livestock Grazing Management. If an allotment, or a portion thereof, is determined to not be meeting standards, then causal factors are evaluated; i.e. current grazing management, drought, wildfire, vegetation manipulation, wildlife use, or other.

The BLM administers 10 grazing permits authorizing livestock grazing on 9 allotments in the North Delta Land Health Assessment Unit (Figure 2). A livestock producer (permittee/lessee) must hold a grazing permit/lease to graze livestock on public land. Grazing Permits specify all authorized use including; allotment to be grazed, number of livestock, class of livestock, season of use, percent public land, active AUMs, suspended AUMs, temporary suspended AUMs, and grazing preference (CFR §1400.0-5).

The initial Land Health Assessment (LHA) was completed for the North Delta Land Health Unit during the 2002 field season. In 2012, the second North Delta LHA was completed and included utilization and long term vegetation monitoring data collected during the past 10 years. This monitoring allows BLM to evaluate the allotments during the permit renewal process to determine if current grazing management and Terms and Conditions are working, evaluate carrying capacities and stocking rates, and make changes to the permits if necessary.

The North Delta Land Health Unit Grazing Permits are being considered for renewal and are located in Delta County on the western slope of Colorado. For cumulative analysis purposes, a larger general area is being used. The majority of the general area is located in Montrose and Delta Counties. The general area is comprised of three Land Health Assessment (LHA) units, Escalante, North Delta, and Gunnison Gorge (Figure1). Total acres are approximately 547,000 and are composed of 291,709 acres of BLM, 27,000 acres of Black Canyon National Park, 1,982 acres of state land, and 201,521 acres of private land. The Uncompahgre Field Office will cumulatively analyze impacts on the broader 3 Land Health units while focusing detailed analysis on the North Delta LHA unit where applications for grazing permit renewals have been received.

Figure1 Escalante North Delta, and Gunnison Gorge LHA Units



PURPOSE OF AND NEED FOR THE ACTION

The BLM is considering the reissuance of 10 grazing permits authorizing livestock grazing on 9 allotments in the North Delta Land Health Unit. Of these allotments, one is a common allotment with 5 permits authorizing cattle use, one is a single allotment with one permit authorizing cattle use and 4 are single allotments authorizing sheep use. The purpose of the action is to issue Term Grazing Permits (CFR §4130.2(d)) and implement or modify Terms and Conditions and Authorizations where necessary.

Decisions to be made:
The decision BLM will make, based on the NEPA analysis, would be to approve the re-issuance of term grazing permits in the North Delta LHA unit with no modifications to the Authorizations and/or Term and Conditions of the current term grazing permits (current management); approve the re-issuance of term grazing permits with modifications to the Authorizations and/or Terms and Conditions (proposed action); or not approve the re-issuance of the term grazing permits (no grazing).

ISSUES AND CONCERNS:

The cumulative analysis area includes three LHA units including, North Delta, Escalante, and Gunnison Gorge. There are common permittees across all three LHA units, and impacts to current grazing management in one LHA unit, has the potential to affect permittee grazing operations in the North Delta, Escalante and Gunnison Gorge land health units, due to the similarities in vegetation, soils, and wildlife.

The project area is located north of Delta Colorado within the North Delta LHA Unit (Figure 2) which includes the Adobe Badlands Outstanding Natural Area/Area of Critical Environmental Concern (ACEC). The outstanding values for the ACEC include unique scenic qualities, T&E species, and erosive soils. In addition, part of the permit renewal area contains habitat and occurrences of Federally Listed species Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), which may have conflicts with livestock management activities.

Portions of the project area are located in proximity to occupied Desert and Rocky Mountain bighorn sheep habitat, which may have conflicts with domestic sheep grazing. Portions of the project area contain habitat for Pronghorn antelope which are an important game animal on most salt desert shrub ranges. There are several factors that promote healthy pronghorn herds including adequate water during the summer, desirable shrubs in the winter and forbs in the spring and summer. With large tracts in the project area meeting with problems, downward trends or not meeting Standard 3 Healthy Vegetative Communities, the rangeland may not be providing adequate browse, forbs and hiding cover for the sustainability of pronghorn herds.

Segments of the project area either did not meet, or met with problems for both land health assessments (2002/2012) for Land Health Standards (LHS) 1 (Soils), 3 (Healthy Communities) and/or 4 (Special Status Species), and for some allotments, one of the main causal factors was due to current livestock management. A Land Health Assessment summary by Allotment is listed in Table 1.

BLM manages livestock on public lands both during and the critical recovery time after drought. Drought has been defined by the Society of Range Management as "A prolonged chronic shortage of water, as compared to the norm, often associated with high temperatures and winds during spring, summer, and fall." National BLM guidance from IM 2013-094 *Resource Management During Drought*[1] specifies that the BLM must "modify authorized uses or management practices when necessary to lessen their impact to drought-stressed public land resources." It also states that BLM should put in place a "proactive mechanism to address potential drought conditions and contingencies".

Selenium and salinity are naturally occurring elements found in the marine sediments of the Mancos Shale. They can be easily mobilized by surface disturbing activities and delivered to nearby waterways by overland flow and erosional processes during storm events. Existing selenium levels in the Uncompahgre and Gunnison Rivers exceed State water quality standards.

There are economic and social ties associated with livestock grazing of federal public lands, on both BLM and USFS. Ferriday[2] determined that over 16% of private land in the six counties (Delta, Gunnison, Mesa, Montrose, Ouray, and San Miguel) surrounding the Grand Mesa Uncompahgre (GMUG) National Forest may be economically tied to permitted livestock grazing on USFS lands, and approximately 24% of the private land is associated with permitted livestock grazing on both BLM and USFS managed lands. With this stated, the size of the ranch operations and corresponding fixed costs are often established based on availability of federal AUMs, and reduction in these AUMs, implies, that in the short term, fixed costs and debt must still be covered as animal units decrease. Net farm income and equity therefore decreases, and there is incentive for owners to consider selling and/or subdividing land for development, particularly given land prices in many areas surrounding national forests, GMUG National Forest[3]. Additionally, agriculture continues to be an important source of employment comprising 10% and 7% of all jobs in Delta and Montrose counties respectively, and 4% in the six county area[4]. With these agricultural jobs, almost $30 million was being spent on hired farm and contract labor, and $172 million dollars of agricultural product was sold across the six counties surrounding the GMUG, and by association the surrounding BLM lands.[5]

Table 1. Land Health Assessment Summary by Allotment

Allotment Name and Number (Class of Livestock)	***Land Health Assessment***													
	TE Plants[b]	***Bighorn[c]***	***ONA/ACEC***	***Standard 1 Soils[d]***			***Standard 3 Healthy Communities[d]***			***Standard 4 Special Status Species[d]***			***LHA Issues***	***Weeds [e]***
				Meet	***MWP***	***NM***	***Meet***	***MWP***	***NM***	***Meet***	***MWP***	***NM***		
Alkali Flats 14017 (sheep)	✓ X	✓	N/A	0	7,923	901	0	3,151	5,673	0	3,151	5,673	Over all the allotment saw a decline in cover for forbs, shrubs [f], and increases in exotics [f].	IA, NW
Deer Basin/ Midway 14019 (sheep)	✓ X	✓	X (lower portion)	5,898	2,392	3,035	0	8,089	3,035	0	8,089	3,035	Over all exotics increased, decrease in shrubs [f], decrease in natives.	IA, NW
Delta Pipeline 03277 (sheep)	✓ X	✓	X	5,898	0	0	0	3,095	2,803	1,427	1,668	2,803	Problems with shrub cover, forbs, and increases in exotics	IA, NW
Dirty George 14023 (cattle)	N/A	N/A	N/A	580	677	0	1,257	0	0	1,390	0	0	This is a P/J site and the pooled transects did not show noteworthy concerns.	IA, NW

Allotment Name and Number (Class of Livestock)	*Land Health Assessment*													
	TE Plants[b]	*Bighorn*[c]	*ONA/ACEC*	*Standard 1 Soils*[d]			*Standard 3 Healthy Communities*[d]			*Standard 4 Special Status Species*[d]			*LHA Issues*	*Weeds* [e]
				Meet	*MWP*	*NM*	*Meet*	*MWP*	*NM*	*Meet*	*MWP*	*NM*		
Petrie Mesa 14022 (sheep)	✓ X	✓	✓ X	2,006	767	0	0	2,006	767	0	2,006	767	Significantly low shrub cover, forb, and cool season grass cover. Sites dominated by exotic plants.	IA, NW
Point Creek 14021 (sheep)	✓ X	✓	N/A	1,601	0	0	608	0	993	608	993	0	High amounts of exotic plants on sites, low shrub and cool season grass cover.	IA, NW
South Branch 14004 (cattle)	N/A	N/A	N/A	402	372	0	774	0	0	774	0	0	Trees and shrubs appropriate for P/J site	IA, NW
Wells Gulch 14016 (sheep)	✓ X	✓	N/A	9,890	381	0	2,835	7,436	0	3,325	6,950	0	Exotic weeds, drought, major ROW, and some isolated soil issues due to large storm event.	IA, NW

Allotment Name and Number (Class of Livestock)	*Land Health Assessment*													
	TE Plants[b]	*Bighorn*[c]	*ONA/ACEC*	*Standard 1 Soils*[d]			*Standard 3 Healthy Communities*[d]			*Standard 4 Special Status Species*[d]			*LHA Issues*	*Weeds* [e]
				Meet	*MWP*	*NM*	*Meet*	*MWP*	*NM*	*Meet*	*MWP*	*NM*		
Ward Creek/ Dough Spoon 14025 (cattle)	✓	N/A		6,249	10,107	0	3,505	12,851	0	3,974	12,382	0	Overall the there is a lack of cool season grasses on the allotment, low forbs. Noxious and exotic plants are a problem.	IA, NW

[b] TE Plants—Allotments considered to be within the potential habitat or has occurrences of Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) .

[c] Bighorn High—Allotments considered to be a high probability of interaction between domestic sheep and wild bighorn sheep; Bighorn Medium—Allotments considered to be a medium probability of interaction between domestic sheep and wild bighorn sheep; Bighorn Low—Allotments considered to be a low probability of interaction between domestic sheep and wild bighorn sheep

[d] Number of acres within each category for the Allotment; Meet—Meets Land Health Standard; MWP—Meets Land Health Standard, but with Problems; NM—Does not meet Land Health Standard.

[e] IA – Invasive Annuals; NW – Noxious Weeds

[f] Statistically significant

Table 2. Land Health Acreage by Allotment for Standard 3 Vegetation "Not Meeting" or "Meeting with Problems with a Downward Trend" with Livestock Management a Contributing Factor.

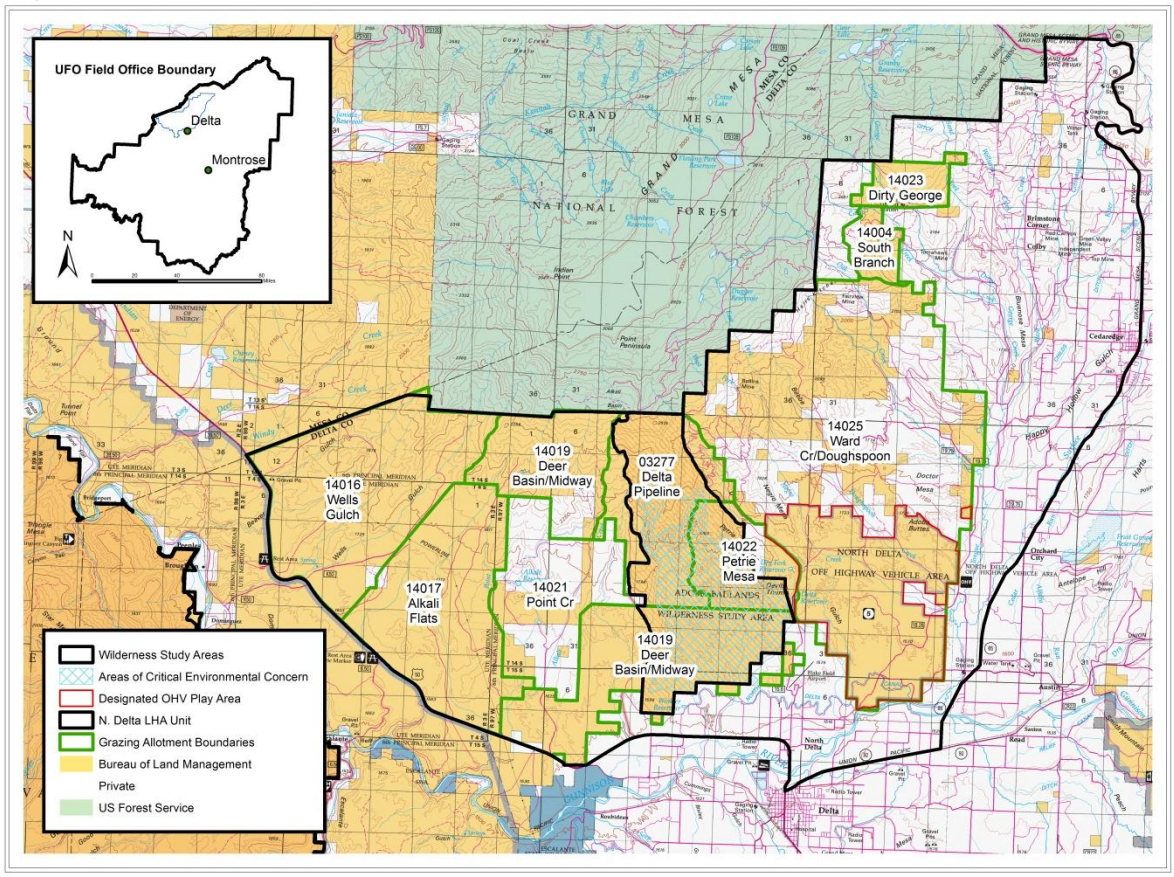
Allotment	Public Land Acres	Not Meeting (NM) for Land Health Standard (Acres/[%])		Meeting with Problems (MP) for Land Health Standard		Problem Acres and Percent of Allotment	
		Total Acres NM	Acres NM with Livestock Mgt. Contributing	Total Acres MP	Total Acres MP Trend Down Livestock Mgt. Contributing	Acres Livestock Mgt. Contributing	Allotment % of Acres Livestock Mgt. Contributing
Alkali Flats, #14017	8,900	5,675	4,773	3,151	2,260	7,033	78%
Deer Basin/Midway, #14019	11,701	3,047	3,047	8,586	1,573	4,620	40%
Delta Pipeline # 03277	6,029	2,803	2,803	3,099	0	2,803	47%
Petrie Mesa #14022	2,841	767	767	2,006	0	767	27%
Point Creek #14021	1,586	995	995	0	0	995	62%
Wells Gulch # 14016	10,412	0	0	7,436	0	0	0

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Proposed Action:

The BLM would re-issue livestock grazing permits with allotment specific Terms and Conditions within the North Delta LHA Unit (Figure 2). Under this alternative, where necessary, grazing permit authorization(s)/ allocation(s) and Terms and Conditions may be modified so progress can be made towards meeting the fundamentals of rangeland health. Modifications may include reductions in AUMs, adjustments in season of use, more intensive livestock management, and changes in percent public land, utilization, carrying capacity, stocking rate, class of livestock or timing, intensity, or duration of grazing, or the use of other grazing seasons not stated on the current permit. Additionally, modifications to the permit may be made in response to environmental events such as drought, heavy snow fall, and flooding. During times of drought, modifications will include advance planning and communication, **field-level** data collection and use of a variety of standard range management practices. The practices, hereafter referred to as Drought Response Tools or DRTs, will be applied during drought situations where and when necessary in grazing allotments.

Figure 2. North Delta LHA Unit



Currently, there are allotments with over allocated AUMs, as supported by past and current Land Health Assessments, long term cover data, range site descriptions (ecological site descriptions), and current utilization data. These allotments will have allocations AUMs adjusted to reflect current forage availability and to allow the allotment to move towards meeting land health standards as supported by CFR §4110.3-2 and §4110.3-3. Where it is suggested, AUMs will be adjusted to reflect sustainable rangeland grazing use. AUMs could also be permanently removed from the permit, or a portion of AUMs could be placed in suspension for future use as the allotment improves and is more reflective of the range site descriptions. Adjustments to AUMs will be phased in over a 3 year period. Science-based grazing season utilization guidelines, utilization mapping, long term trend studies and actual use will be used as tools to aid in determining if appropriate permit allocation levels (AUMs/carrying capacity) are achieved. Utilization guidelines are for a given grazing season, for key forage species pertinent to each individual allotment, and grazing species.

In the previous permit renewal, the Alkali Flats and Wells Gulch allotments consisted of approximately 12,433 and 16,879 acres, respectively. During this process, 3,464 acres will be removed from the Alkali Flats allotment to create the Huff Allotment #04294, and 6,536 acres will be removed from the Wells Gulch allotment to create the Dominguez Rims allotment #04293. The allotments are divided along the highway, and the Dominguez Escalante National Conservation Area (D-E NCA) boundary. Huff and Dominguez Rims are within the D-E NCA and will be analyzed under a separate permit renewal in the future. The remaining portions of Alkali Flats and Wells Gulch are within this permit renewal process.

Design features, and Terms and Conditions for grazing permits are described below, and for each individual allotment in Table 3. Allotment Descriptions, Evaluations, and Modifications are located in the Range analysis section of this EA. All permits will be analyzed with a two week variable window on each side of the on/off date (not to exceed AUMs) to account for seasonal variations in range condition and to promote cooperation and management of grazing permits administered by the United States Forest Service. Modifications to permits and/or Terms and Conditions are subject to change as determined by the authorized officer and with consultation with the permittee.

Table 3. Proposed Action AUM Adjustments

Allotment Name and Number	***Livestock Number/ Kind***	***Grazing Period (MM/DD)***		***%PL***	***Current Active AUMs[1]***	***Proposed Active AUMs[2]***	***Suspended AUMs[3]***	***Retired AUMs[3]***	***Terms and Conditions[5]***	***Appropriate AUMs based on 18 to 25 ac/AUM.[6]*** **Literature Reference capacity suggested for Salt Desert Shrub**
		Begin	End							
Alkali Flats #14017	1000/ Sheep	1-Dec	28-Feb	100	1,001	493	35	473	All Std's, BH-S, BH-M, All PTE, LE1,	528
Deer Basin/Midway #14019	1567/ Sheep	1-Dec	12-Feb	96	900	249	331	320	All Std's, BH-S, BH-M, All PTE, LE1,	580
Delta Pipeline #03277	1000/ Sheep	1-Dec	1-Mar	100	563	252	98	213	All Std's, BH-S, BH-M, All PTE, LE1,	350
Dirty George #14023	200/ Cattle	15-Oct	20-Oct	100	39	39	0	0	All Std's, R1-2	39
	205/ Cattle	2-Jun	15-Jun	100	94	94	0	0	All Std's, R1-2	94
Petrie Mesa #14022	1000/ Sheep	9-Dec	1-Mar	100	104	51	53	0	All Std's, BH-S, BH-M, All PTE, LE1,	104
Point Creek #14021	1000/ Sheep	16-Apr or 16-Nov	31-May or 1-Mar	24	102	39	29	34	All Std's, BH-S, BH-M, All PTE, LE1,	68
South Branch #14004	111/ Cattle	15-Oct	29-Oct	65	36	36	0	0	All Std's, R1-2	36
	112/ Cattle	4-Jun	30-Jun	65	65	65	0	0	All Std's, R1-2	65

Allotment Name and Number	*Livestock Number/ Kind*	*Grazing Period (MM/DD)*		*%PL*	*Current Active AUMs[1]*	*Proposed Active AUMs[2]*	*Suspended AUMs[3]*	*Retired AUMs[3]*	*Terms and Conditions[5]*	*Appropriate AUMs based on 18 to 25 ac/AUM.[6]* **Literature Reference capacity suggested for Salt Desert Shrub**
		Begin	End							
Ward Creek/Dough Spoon #14025	25/ Cattle	16-Oct	1-Nov	63	9	9	0	0	All Std's, All PTE, LE1	9
	226/ Cattle	27-May	15-Jun	64	95	95	0	0	All Std's, All PTE, LE1	95
	226/ Cattle	16-Oct	18-Oct	64	14	14	0	0	All Std's, All PTE, LE1	14
	26/ Cattle	16-Oct	27-Oct	100	10	10	0	0	All Std's, All PTE, LE1	10
	58/ Cattle	2-May	16-Jun	100	88	88	0	0	All Std's, All PTE, LE1	88
	21/ Cattle	2-May	16-Jun	100	32	32	0	0	All Std's, All PTE, LE1	32
	11/ Cattle	16-Oct	27-Oct	100	4	4	0	0	All Std's, All PTE, LE1	4
	90/ Cattle	16-Oct	2-Nov	100	53	53	0	0	All Std's, All PTE, LE1	53
	142/ Cattle	17-May	15-Jun	100	140	140	0	0	All Std's, All PTE, LE1	140
Wells Gulch #14016	3245/ Sheep	1-Dec	10-Mar	100	1,433	1,172	0	261	All Std's, BH-S, BH-M, All PTE, LE1,	1,433

[1]Current Active AUMs: Currently what is authorized for use on the grazing permit. [2]Proposed Active AUMs: What is proposed for authorized use on the permit, and was adjusted using an average of 10 year actual use AUMs. [3]Suspended AUMs: AUMs put in suspension for future use when the allotment shows improvement. [4]Retired AUMs: AUMs that are proposed to be removed from the permit. [5]Terms and Conditions descriptions are listed below under Terms and Conditions. [6]Managing Intermountain Rangelands-Salt-Desert Shrub Ranges J. Blaisdell & R. Homgren 1984**Error! Bookmark not defined.**.

Terms and Conditions

Standard Terms and Conditions Common to All Permits (Standard).

- Grazing will be limited to 18 days or less in each pasture or use area during the growing season to prevent grazing of plant re-growth. This limitation does not apply to dormant season grazing periods.
- Grazing will be deferred on new vegetation treatments and rehabilitated burned areas to the extent necessary to comply with BLM Colorado Standards for Public Land Health and Guidelines for Livestock Grazing Management.
- Periodic authorization of grazing outside the time period (15 days pre and post grazing dates) specified in the grazing permit may be allowed with prior approval from the authorized officer.
- Spring and fall grazing of BLM pastures or use areas occurring in the same year will usually not be authorized. Exceptions could be made to accommodate grazing deferments associated with fire stabilization and rehabilitation, or vegetation treatments. This kind of authorization would be granted only after notification and consultation with the authorized officer.
- The BLM authorized officer must be contacted prior to any range project maintenance activity, e.g. cleaning of ponds or reservoirs with heavy equipment, which would involve soil surface disturbance. All heavy equipment would be washed and free of debris before entering BLM lands.
- The grazing permit authorizes motorized access off existing public routes for administrative and maintenance purposes of range improvement projects only. In areas where there is a concern for threatened and endangered plants see PTE3.
- Grazing will be managed in a way that does not encourage the establishment or spread of weeds or other invasive plants and does not conflict with efforts to treat such weeds and invasive plants.
- Salt, protein, energy, and mineral supplement sites must be at least ¼ mile (or as far as practical) from permanent water sources. The exception to this is placing salt in the bottom of reservoirs for sealing purposes. All energy sources (corn) will be fed on a hardened surface such as a road and at least 200 meters (656 feet) from occupied Threatened and Endangered Plant habitat.
- The operator is responsible for informing all persons who are associated with the allotment operations that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts. If historic or archaeological materials are uncovered during any allotment activities and grazing activities, the operator is to immediately stop activities in the immediate area of the find that might further disturb such materials, and immediately contact the authorized officer authorized officer. Within five working days, the AO will inform the operator as to:
  whether the materials appear eligible for the National Register of Historic Places, and
  whether the mitigation measures the operator will likely have to undertake before the identified area can be used for grazing activities again.
- Pursuant to 43 CFR 10.4(g), the holder of this authorization must notify the authorized officer, by telephone, or with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further,

pursuant to 43 CFR 10.4(c) and (d), anyone must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the authorized officer.

- If paleontological materials (fossils) are uncovered during Allotment activities, the operator is to immediately stop activities that might further disturb such materials, and contact the authorized officer (AO). The operator and the authorized officer will consult and determine the best option for avoiding or mitigating paleontological site damage.
- The Authorized Officer may approve higher level utilization when plant health will not be compromised and rapid plant re-growth is anticipated.

Riparian Terms and Conditions

R1. In riparian areas, dormant and growing season utilization will be 35%, or match uplan utilization levels, whichever is lower for native woody riparian species.

Big Horn Sheep Terms and Conditions

Terms and Conditions are additive from Some through High probability of interaction.

Some Probability of Interaction (BH-S)

BH1. All ewes must be bred before turn out onto BLM.
BH2. Mandatory use of at least 2 guard dogs per band to deter co-mingling.
BH3. Only healthy domestic sheep shall be turned out onto BLM.
BH4. No scheduled lambing of domestic sheep shall occur on BLM.
BH5. Sweep allotments within 24 hours of moving off to capture any strays.
BH6. Use of marker sheep within bands; at least 1/100head.
BH7. Remove sick, physically disabled or dead domestic sheep from the band and BLM lands as soon as possible after discovery.
BH8. Use only highly gregarious breeds of domestic sheep.
BH9. Maintain a band of no greater than 2000 head based on manageability by herder.

Moderate Probability of Interaction (BH-M)

BH 10. Mandatory use of at least 3 guard dogs per band to deter co-mingling in Moderate Probability allotments
BH 11. During spring use, limit band size for ewes with lambs. Numbers would be determined on a permit-by-permit basis based on site specific information.
BH 12. Require a submission of dead report to be turned in at the end of the grazing season.
BH 13. No yearling ewes will be turned out during the desert bighorn sheep breeding season (August 1- September 30).
BH 14. Decrease probability of interaction between bighorn and domestic sheep by creating barriers to movement (fences, herding, hazing, etc.) utilizing available topographic and natural barriers where feasible.

High Probability of Interaction (BH-H)

BH 15. Shorten the time period domestic sheep spend close to known bighorn use areas. Mandatory use of at least 4 guard dogs per band to deter co-mingling

Plant Threatened or Endangered Terms and Conditions (PTE)

(Biological Opinion: ES/GJ-6-CO-12-F-006, TAILS 06E24100-2012-F-0020)

PTE 1. No concentrations of livestock activities including but not limited to herding, routine trailing, bedding (except dispersed), salt or supplement, portable watering and new range improvements will be allowed within 200 meters (656 feet) of plant populations.

PTE 2. To minimize sheep grazing impacts in allotments containing Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), limit sheep grazing within 200 meters (656 ft) of occupied habitat to 5 nights per use area.

PTE 3. Within 200 meters (656 ft) of listed plants, motorized access for livestock grazing operations will be limited to existing roads and routes.

PTE 4. No concentrations of livestock activities including but not limited to herding, routine trailing, bedding (except dispersed), salt or supplement, portable watering, will be allowed within 200 meters (656 ft) of known endangered plant populations, exceptions are provided in the BO pg. 15 for this term and condition.

PTE 5. As a standard permit term and condition within occupied habitat of threaten and endangered plant species, grazing season utilization levels of palatable perennial forage will be limited to approximately 35% except around congregation areas for example ponds, watering areas, fences, bedgrounds, and cattle guards.

PTE 6. The permittee will be required to notify the BLM authorized officer at least 48 hours in advance of trailing activities.

Design Features (DF)

In addition to terms and conditions of the grazing permit described later in this document, the following are design features for this alternative.

Standard Design Features

Drought Design Features

- After collaboration with the permittee, modifications to the permit may be made in response to abnormal environmental events such as drought, heavy snow fall, and flooding etc. Modification may include timing, intensity, or duration of grazing, or the use of other grazing seasons not stated on the permit.
- During times of drought, trigger points (Table 4) and drought monitoring processes are described in the Drought Detection and Monitoring Plan **APPENDIX A** may be implemented.

Table 4 Drought Trigger Points

Trigger Point*	***Drought Management Objectives***
Moderate Drought	Assess conditions January 15 prior to spring turnout, and June 15 prior to fall or winter turnout. Send a drought notification letter informing permittees of the moderate drought conditions, reduced forage production, and the concern that if moisture doesn't come in the next few months to expect changes in management.
Severe Drought	If drought conditions are severe at March 15th for spring turnout or August 15th for fall or winter turnout, schedule drought monitoring field visits to be conducted 2-4 weeks prior to turn out to assess field conditions. Permittees will be invited to assist in monitoring. If field verified severe drought: • defer grazing past active growth; or • limit utilization to no less than 2-2.5 inch stubble height on rhizomatous species (not sod bound), 2.5-4 inches on bunchgrasses (depending upon key species), and shrub utilization to <15% of the leaders browsed[6,7]
Extreme Drought	If field verified extreme drought, manage for minimal use i.e.: • trailing only (active movement of livestock), • permit use of pastures meeting land health standards that have been rested prior years: limit utilization to no less than 2.5 inch stubble height on rhizomatous species (not sod bound), 2.5-4 inches on bunchgrasses (depending upon key species), and shrub utilization to <15% of the leaders browsed[6, 7] • During multiyear severe or extreme drought implement complete rest
Post Drought Recovery (1-2 years following a severe or extreme drought episode)	Based on site specific field verification • Complete rest; or • defer grazing past active growth; and • limit utilization to no less than 2.5 inch stubble height on rhizomatous species (not sod bound), 2.5-4 inches on bunchgrasses (depending upon species), and shrub utilization to <15% of the leaders browsed[6, 7] • Or resume permitted grazing without restrictions

The Trigger Points used to initiate DRTs are Moderate, Severe, and Extreme Drought severity categories.

These categories are established by the United States Drought Monitor (http://droughtmonitor.unl.edu/). They describe different levels of drought in terms of regional impacts to water availability and crops as follows:

- Moderate Drought: Some damage to crops, pastures; streams, reservoirs, or wells, some water shortages developing or imminent; voluntary water-use restrictions requested
- Severe Drought: soil moisture and weekly stream flows estimated in the 6-10th percentile of normal, and impacts of crop or pasture losses likely; water shortages common; water restrictions imposed
- Extreme Drought: soil moisture and weekly stream flows estimated in the 3-5th percentile of normal, and impacts of major crop/pasture losses; widespread water shortages or restrictions

Bighorn Sheep Design Features

- Prohibit the changing of cattle to sheep in allotments with high probability levels of interaction with bighorn sheep until current science mitigates risk.
- Where possible shorten the time period spent close to known bighorn use areas.
- When opportunities arise, consider changing class of livestock in sheep allotments to cattle, to reduce the probability of interaction between domestic and wild sheep. These allotments would be evaluated on basis of site specific domestic/bighorn sheep information and probability levels.

Alternative 1 Considered but Not Carried Forward

This alternative developed a reduced-grazing strategy, proportionate to the percent of the allotment meeting with problems, with downward trends, or not meeting Land Health Standard 3 Vegetation, and with livestock management as one of the significant causal factors, Table 5. All other allotments remain the same as the proposed alternative. All Terms and Conditions remain the same as under the proposed alternative (See Terms and Conditions section for Proposed Alternative). This alternative was not considered, because it closely resembles the proposed action for most allotments in this alternative. In addition, it did not address stock rate and carrying capacity of allotments, in comparison to the ecological site capabilities, or utilization adjustments on other allotments within the North Delta permit renewal area.

Table 5. Alternative 1

Allotment Name & Number	Livestock Number/ Kind	Public Land Allotment Acres	Grazing Period (MM/DD)		%PL	Type Use	Current AUMs (Percent Reduction)	Proposed Active AUMs	Suspended AUMs	Retired AUMs
			Begin	End						
Alkali Flats #14017	1920 Sheep	8,900	12/1	3/1	100	Active	1387(78%)	305	223	859
Deer Basin/ Midway #14019	1567 Sheep	11,701	12/1	3/1	100	Active	900(40%)	540	192	168
Delta Pipeline # 03277	1200 Sheep	6,029	12/1	3/1	100	Active	563(47%)	298	52	213
Petrie Mesa #14022	1000 Sheep	2,841	12/1	3/1	100	Active	104(27%)	76	28	0
Point Creek #14021	1000 Sheep	1,586	4/16 or 11/16	5/31 or 3/1	24	Active	102(62%)	39	63	0

Alternative 2 (No Grazing)
Livestock grazing permits would not be renewed. The no grazing alternative would deny all applications for grazing permit renewal. Permits would be expired at the end of their current ten-year authorization, and no further grazing would take place on any allotment within the project area.

No Action (Current Management)
The no-action alternative would re-issue all the livestock grazing permits with the same Authorizations (Table 6), and terms and conditions that are on the existing permit. This alternative does not take into account "making significant progress toward or maintaining watersheds as stated in §4180.1 Fundamentals of Rangeland Health.

Table 6 No Action (Current) Grazing Allotments and Authorization

Allotment Name and Number	*Public Land Acres*	*Class of Livestock*	*Livestock Numbers*	*Season of Use*	*Active AUM's*	*% Public Land*[1]	*Existing Allotment Category*[2]
Alkali Flats #14017	12,433	Sheep	1920	12/01-2/28	1,387	100	I
			1912	03/01-03/20			
Deer Basin/Midway #14019	11,701	Sheep	1567	12/20-3/20	900	96	I
Delta Pipeline #03277	6,029	Sheep	784	12/01-02/28	563	100	I
			750	03/01-03/20			
Dirty George #14023	1,389	Cattle	205	06/02-06/15	133	100	M
			200	10/15-10/20			
Petrie Mesa #14022	2,841	Sheep	155	12/09-03/20	104	100	M
Point Creek #14021	1,586	Sheep	400	04/16-05/31	102	24	C
			400	11/16-3/10			
South Branch #14004	825	Cattle	112	06/04-06/30	101	65	M
			111	10/15-10/29			
Ward Creek/Dough Spoon #14025	17,190	Cattle	25	10/16-11/01	445	63-100	I
			142	05/17-06/15			
			90	10/16-11/02			
			79	05/02-06/16			
			37	10/16-10/27			
			226	5/27-06/15			
			226	10/16-10/18			
Wells Gulch #14016	16,879	Sheep	3230	03/01-03/21	2,366	100	I
			3245	12-01-02/28			

[1] Dependent on the permitees private land acres unfenced in an allotment.
[2] C—least intensive management; M—less intensive management with an objective of maintaining resource condition; I— most intensive management with objective of improving resource condition.

Table 7 Summary of Alternatives

Allotments	Changes	Proposed Action	Alternative 2 (No Grazing)	No Action (Current Management)	AUMs based on 17 to 25 ac/AUM[1] Literature Reference capacity suggested for Salt Desert Shrub
Alkali Flats # 14017	Active AUMs	493	N/A	1,387	528
	10 Year Actual Use AUMs	N/A		629	
	Suspended AUMs	35		0	
	Retired AUMs	473		0	
	Upland Utilization	35%		50% except where basal ground cover is < 10% then 35% utilization is expected	
	Grazing Strategy	Use areas will be delineated with periodic rest incorporated		none	
	Terms&Conditions, Design Features	Std's, BH-M, All PTE, LE1, R1, R2		See Appendix "C" for individual permit T&C	
	Acres	8,900		12,433	
	Allotment Category	Same as No Action		I	
Deer Basin/Midway #14019	Active AUMs	249	N/A	900	580
	10 Year Actual Use AUMs	N/A		355	
	Suspended	331		0	
	Retired	320		0	
	Upland Utilization	35%		50%	
	Grazing Strategy	Use areas will be delineated with periodic rest incorporated		none	
	Terms &Conditions,	Std's, BH-M, All PTE, LE1		See Appendix "C" for individual permit T&C	

Allotments	Changes	Proposed Action	Alternative 2 (No Grazing)	No Action (Current Management)	AUMs based on 17 to 25 ac/AUM[1] Literature Reference capacity suggested for Salt Desert Shrub
	Design Features				
	Acres	Same as No Action		11,701	
	Allotment Category	Same as No Action		I	
Delta Pipeline #03277	Active AUMs	252	N/A	563	350
	10 Year Actual Use AUMs	N/A		410	
	Suspended	98		0	
	Retired	213		0	
	Upland Utilization	35%		50% except where basal ground cover is < 10% then 35% utilization is expected	
	Grazing Strategy	Use areas will be delineated with periodic rest incorporated		none	
	Terms &Conditions, Design Features	Std's, BH-M, All PTE, LE1		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		6,029	
	Allotment Category	Same as No Action		I	
Dirty George #14023	Active AUMs	133	N/A	133	133
	10 Year Actual Use AUMs	N/A		N/A[2]	
	Suspended	0		0	
	Retired	0		0	
	Upland Utilization	50%		50%	
	Grazing Strategy	none		none	

Allotments	Changes	Proposed Action	Alternative 2 (No Grazing)	No Action (Current Management)	AUMs based on 17 to 25 ac/AUM[1] Literature Reference capacity suggested for Salt Desert Shrub
	Terms &Conditions, Design Features	Std's		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		1,389	
	Allotment Category	Same as No Action		"M"	
Petrie Mesa #14022	Active AUMs	51	N/A	104	104
	10 Year Actual Use AUMs	N/A		73	
	Suspended	53		0	
	Retired	0		0	
	Utilization	35%		50%	
	Grazing Strategy	Use areas will be delineated and a grazing strategy developed.		none	
	Terms &Conditions, Design Features	Std's, BH-M, All PTE, LE1		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		2,841	
	Allotment Category	"I"		"M"	

Allotments	Changes	Proposed Action	Alternative 2 (No Grazing)	No Action (Current Management)	AUMs based on 17 to 25 ac/AUM[1] Literature Reference capacity suggested for Salt Desert Shrub
Point Creek #14021	Active AUMs	39	N/A	102	68
	10 Year Actual Use AUMs	N/A		56	
	Suspended	29		0	
	Retired	34		0	
	Upland Utilization	35%		N/A	
	Grazing Strategy	Use areas will be delineated with periodic rest incorporated		none	
	Terms &Conditions, Design Features	Std's, BH-M, All PTE, LE1		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		1,586	
	Allotment Category	"I"		"M"	
South Branch #14004	Active AUMs	101	N/A	101	101
	10 Year Actual Use AUMs	N/A		N/A[2]	
	Suspended	0		0	
	Retired	0		0	
	Upland Utilization	50%		50%	
	Grazing Strategy	none		none	
	Terms &Conditions, Design Features	Std's		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		825	
	Allotment Category	Same as No Action		"M"	
				445	

Allotments	Changes	Proposed Action	Alternative 2 (No Grazing)	No Action (Current Management)	AUMs based on 17 to 25 ac/AUM[1] Literature Reference capacity suggested for Salt Desert Shrub
WardCreek/ Dough Spoon #14025	Active AUMs	445	N/A		445
	10 Year Actual Use AUMs	N/A		N/A[2]	
	Suspended	0		0	
	Retired	0		0	
	Upland Utilization	35%		50%	
	Grazing Strategy	none		none	
	Terms &Conditions, Design Features	Std's, PTE, LE1,R2		See Appendix "C" for individual permit T&C	
	Acres	Same as No Action		17,190	
	Allotment Category	Same as No Action		"I"	
Wells Gulch #14016	Active AUMs	1,172	N/A	2,366	1,172 AUMs calculated on ecological site types
	10 Year Actual Use AUMs (high)	N/A		N/A[2]	
	Suspended	0		0	
	Retired	261		0	
	Upland Utilization	35%		50%	
	Grazing Strategy	Same as No Action		Has delineated use areas and manages deferred grazing rotation system	
	Terms &Conditions, Design Features	Std's, BH-M, All PTE, LE1		See Appendix "C" for individual permit T&C	
	Acres	10,343		16,879	
	Allotment Category	Same as No Action		"I"	

[1] Managing Intermountain Rangelands-Salt-Desert Shrub Ranges J. Blaisdell & R. Homgren 1984. [2] N/A No Adjustment Were Done On Permits In Regards To 10 Year Actual Use Data

SCOPING AND PUBLIC INVOLVEMENT AND ISSUES

The LHA scoping consisted of sending informational letters out to the permittees, local counties, and interested publics. The information was also available on the UFO web page for public viewing. Issues identified are listed below:

- Land Health Assessment is being evaluated to make incorrect analysis to reduce carrying capacity (AUM's).
- The EA didn't provide a review of the appropriate action taken after the 2002 S&G failure, and why they failed.
- AUMs should be removed from permit not left in suspension.
- Utilization rate is too high for salt desert shrub communities.
- Drought section limits use to 2.5-4", which species and what research supports this statement.
- How do big horn sheep recommendations relate to 9 mile effective buffers for separation On what research is the BLM relying on to come to this conclusion.
- The term "Periodic authorization of grazing outside the time period (15 days pre and post grazing dates) specified in the grazing permit may be allowed with prior approval." Violates NEPA as well as IP requirements" and needs to be removed.
- Supplemental feeding on publics lands. Supplemental feeding of livestock is not allowed on public lands outside of "emergency" situations.
- Actual use reports need to be properly filled out and submitted within 15 days of livestock removal off the allotment, and no further authorizations will be granted until the BLM receives properly completed actual use reports
- The Authorized Officer may approve higher level utilization when plant health will not be compromised and rapid plant re-growth is anticipated." This is another massive loophole that does not comply with NEPA or IP requirements, and must be removed.
- Grazing will be managed in a way that does not encourage the establishment or spread of weeds or other invasive plants" All livestock grazing promotes the spread of invasive species. That aside the term is meaningless as neither are these ways discussed, their effectiveness determined or any actions implemented.
- Concerns over vegetation treatment on salt desert shrub communities.
- Why wait for two years of permit violations before taking action?
- There needs to be discussion of the factors that placed most of the allotments in I category and what actions have been taken since they were categorized.
- Risk of contact between domestic sheep grazing and bighorn sheep in Dominguez Escalante NCA, Gunnison Gorge NCA and North Delta LH unit.
- Rocky Mountain Bighorn Society (RMBS) wants ROC model used as the best scientific tool.
- RMBS request no new domestic sheep grazing allotments be created or conversions in class of livestock to domestic sheep occur. WAFWA guidelines explicitly note that, "effectiveness of management practices designed to reduce risk of association are not proven and therefore should not be solely relied upon to achieve effective separation." Therefore, we request that the BLM not rely on BMP to achieve effective separation in the North Delta area.

PLAN CONFORMANCE REVIEW

The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR 1610.5-3, BLM 1617.3):

Name of Plan: Uncompahgre Resource Management Plan and Record of Decision
Date Approved: 1989
Decision Number/Page: 11
Decision Language: Suitable public lands will be available for livestock grazing use.

Other Authorities:

Taylor Grazing Act (43 U.S.C. §§ 315-316o, June 28, 1934, as amended 1936, 1938, 1939, 1942, 1947, 1948, 1954 and 1976) was the first federal effort to regulate grazing on federal public lands. It establishes grazing districts and uses a permitting system to manage livestock grazing in the districts.

§ 315b. Grazing Permits. The Secretary is authorized to issue permits to graze livestock in grazing districts to settlers, residents and other stock owners upon the annual payment of reasonable fees. Permits must be for a period of not more than ten years, with renewal subject to the discretion of the Secretary, who shall specify numbers of stock and seasons of use. During periods of range depletion due to severe drought or other natural causes, or during epidemics, the Secretary may remit, reduce, refund in whole or part, or postpone payment of grazing fees for the time the emergency exists. Grazing privileges must be safeguarded adequately but must not create any right, title, interest or estate in or to the lands.

Federal Land Policy and Management Act (43 U.S.C.1752) states that Public lands will be managed on the basis of multiple use and sustained yield.

§ 402. Grazing leases and permits. Permits and leases for domestic livestock grazing on public lands issued by the Secretary... shall be for a term of ten years subject to such Terms and Conditions the Secretary concerned deems appropriate.

Standards for Public Land Health: In January 1997, Colorado Bureau of Land Management (BLM) approved the Standards for Public Land Health. Standards describe conditions needed to sustain public land health and relate to all uses of the public lands. A finding for each standard will be made in the environmental analysis (next section).

Standard	Definition/Statement
#1 Upland Soils	Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form, and geologic processes. Adequate soil infiltration and permeability allows for the accumulation of soil moisture necessary for optimal plant growth and vigor, and minimizes surface runoff.
#2 Riparian Systems	Riparian systems associated with both running and standing water, function properly and have the ability to recover from major surface disturbances such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment, and provides forage, habitat and bio-diversity. Water quality is improved or maintained. Stable soils store and release water slowly.
#3 Plant and Animal Communities	Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat's potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations, and ecological processes.
#4 Threatened and Endangered Species	Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM, and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.
#5 Water Quality	The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include the designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under State law as found in (5 CCR 1002-8), as required by Section 303(c) of the Clean Water Act.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides a description of the human and environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct, indirect and cumulative effects on the affected environment stemming from the implementation of the Proposed Action and alternatives.

Cumulative impacts of the proposed action and alternatives are shown in the analysis of each element. Past, present and reasonably foreseeable actions known to the BLM, that may occur within the affected area, are shown at the end of this section

Potential effects to the resources/concerns (Table 8) were evaluated to determine if detailed analysis is necessary. Consideration of some elements is to ensure compliance with laws, statutes, regulation or Executive Orders that impose certain requirements upon all Federal actions. Other items are relevant to the management of public lands in general or to the BLM Uncompahgre Field Office (UFO) in particular. Any element not affected by the proposed action will not be analyzed.

Table 8. Issue Statement

Elements	[1]Not Present	[2]Present / No Analysis Needed	[3]Present / Requires Further Analysis	Rationale if not Analyzed or Issue Statement
Air Quality		X		Concentrations of fugitive dust and/or gaseous emissions that could result from livestock are expected to quickly dissipate by wind and topographic features and is not expected to exceed air quality standards.
ACEC			X	There is an ACEC within the Adobe Badlands WSA.
Wilderness	X			
Wilderness Study Areas (BLM Manual Section 6330)			X	Grazing would be allowed to continue as a "grandfathered use." Manual 6330 limits those activities and developments to the same manner and degree as existed on October 21, 1976. Any new proposals would have to meet the non-impairment standard, and therefore would not have an effect on the WSA's wilderness characteristics, and would not constrain Congress's ability to designate the area as wilderness.

Elements	[1]Not Present	[2]Present / No Analysis Needed	[3]Present / Requires Further Analysis	Rationale if not Analyzed or Issue Statement
Lands with Wilderness Characteristics			X	How would livestock grazing and related management activities affect wilderness characteristics within the Adobe Badlands WSA Adjacent wilderness characteristics unit?
Wild and Scenic Rivers			X	How would livestock grazing and related management activities affect the water quality, free-flowing nature, outstandingly remarkable value, and/or tentative classification of WSR Eligible river segment, Gunnison River Segment 2?
Cultural			X	Cultural Resource Inventory of the proposed routes is required under section 106 of the NHPA
Native American Religious Concerns			X	Analysis of specific areas within the project area is required under AIRFA. Depending on the results of the cultural resource inventory, consultation may be required.
Farmlands, Prime/Unique	X			Soils on BLM lands are not considered prime and unique because they are not irrigated.
Soils			X	Is grazing reducing vegetative cover and biologic soil crust, causing erosion and mobilization of selenium and salts?
Vegetation			X	How will action affect native species composition and cover and vigor? How will proposed action change acreages meeting standard 3?
Invasive, Non-native Species			X	Will changes in grazing practices affect the spread, dominance and establishment of noxious and invasive species?
Threatened and Endangered Species			X	How has current and historic grazing practices impacted populations and distribution of cactus? What proposed changes will affect populations? Fish?
Migratory Birds			X	How does grazing influence migratory species of conservation concern?

Elements	[1]Not Present	[2]Present / No Analysis Needed	[3]Present / Requires Further Analysis	Rationale if not Analyzed or Issue Statement
Wildlife, Terrestrial			X	How does grazing management influence forage condition and availability of forage for wild ungulates? Pronghorn recruitment?
Wildlife, Aquatic			X	How might grazing management affect cutthroat in Alkali creek other streams? How do changes in selenium delivery to the Gunnison River affect the endangered big river fishes and critical habitat?
Wetlands & Riparian Zones			X	How will grazing management affect perennial stream bank stability and riparian cover and composition?
Floodplains		X		No proposed development in the floodplain.
Water -- Surface			X	How will grazing practices affect runoff volume and concentrations of salt and selenium in the Gunnison River?
Water -- Ground		X		No impacts to groundwater.
Wastes, Hazardous or Solid	X			The action would not create or impact wastes to the degree it needs to be analyzed.
Environmental Justice		X		The project will not disproportionately impact minority or low income populations.
Socio-Economics			X	How will changes to grazing management affect the livestock permittee and livestock ranching in Delta County? How will constraints to grazing management impact permittee's ranching operation?
Access		X		Livestock grazing will not impact or cause changes to access
Transportation		X		Livestock grazing will not impact or cause changes to the transportation system
Cadastral Survey		X		Livestock grazing will not impact property boundaries or survey monuments.
Realty Authorizations		X		Livestock grazing will not harm or disrupt use of realty authorizations.
Range Management			X	How will the proposed

Elements	[1]Not Present	[2]Present / No Analysis Needed	[3]Present / Requires Further Analysis	Rationale if not Analyzed or Issue Statement
				changes in grazing management move range conditions towards meeting land health standards and stabilize the grazing base for current and future ranchers?
Forest Management		X		Livestock grazing will not affect forest resources in the area.
Fire			X	Although grazing authorized in the alternatives of this EA will reduce fine fuels, the intensity of grazing necessary to be an effective fire management tool at the landscape-level is outside the purpose and need for this permit renewal EA and best addressed in a fire management plan which can integrate all wildland fire management guidance, direction, and activities to implement national fire policy and fire management direction from the resource management plan.
Noise	X			Livestock grazing will not affect noise to the degree that it needs analyzed.
Recreation		X		Proposed action does not affect recreation.
Visual Resources		X		Proposed action does not affect visual resource management class.
Geology and Minerals		X		Proposed action does not affect salable, leasable, locatable minerals.
Paleontology		X		Livestock grazing in this area is expected to have minimal impact to paleontological resources.
Law Enforcement		X		The proposed action would not increase the potential for criminal activity, and would not impact law enforcement.

[1]Not present: the element is not present in the area impacted by the proposed or alternative actions.

[2]Present but no analysis needed: the element may be present, but not affected to a degree that detailed analysis is required.

[3]Present and requires further analysis: the element is present and requires further analysis because:
1) analysis of the issue is necessary to make a reasoned choice between alternatives, or
2) analysis of the issue is necessary to determine the significance of impacts.

GENERAL SETTING

The majority of the project area is located in Montrose and Delta Counties on the western slope of Colorado. The general area is comprised of three Land Health Assessment (LHA) units; Escalante, North Delta, and Gunnison Gorge. Total acres are approximately 547,000 and are composed of 291,709 acres of BLM, 27,000 acres of Black Canyon National Park, 1,982 acres of state land, and 201,521 acres of private land.

Across the project area, the latest land health determinations for upland standards are: 1 Soil, 3 Vegetation, and 4 Wildlife/TES as 45% are meeting, 34% are meeting with problems, and 14% are not meeting. While stream standards are 2 Riparian and 5 Water Quality with 78% meeting, 19% meeting with problems, and 3% not meeting.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)

Indicators: Percent Land Health Standard 3 Vegetation acres meeting, meeting with problems and not meeting.

Assumptions: Only allotments that intersect with the ACEC will be analyzed under the proposed action. The three allotments that intersect with the ACEC are Delta Pipeline, Deer Basin-Midway, and Petrie Mesa.

Affected Environment:

The adobe badlands ONA/ACEC located in the North Delta LHA unit is comprised of approximately 6,380 acres (Table 9). The status of vegetation in the Adobe Badlands ONA/ACEC is of particular concern, since vegetation reflects habitat conditions important for maintaining the ACEC's key values including unique scenic qualities, T&E species habitat and erosive soils. The indicators of greatest concern, within the LHA unit include; exotic invasive plants, low perennial cool season grass cover, low perennial forb cover, low native plant diversity, areas of low perennial warm season grass cover, low shrub vigor and cover, and heavy shrub hedging. The area has 0% acres meeting land health standards, 74% meeting with problems (which are reported as meeting) and 26% not meeting standards. These determinations are due to several factors including historic and current grazing management, historic and current recreation, and exotic invasive species. Trends for the ONA/ACEC depict 0% acres in an upward trend, 28% in static, 55% in downward trend and 17% unknown. For additional vegetation information see the vegetation section.

Table 9 Adobe Badlands ACEC

Adobe Badlands ACEC/ONA			
Allotments	Deer Basin Midway Allotment	Delta Pipeline Allotment	Petrie Mesa Allotment
ACEC Acres	3,041	1,560	1,779
Allotment Acres	8,106	6,021	3,195
Percent of ACEC within allotment boundary	38%	26%	56%
Acres within ACEC Meeting LHS	0	0	0
Acres within ACEC *Meeting with Problems	2,198	974	1,519
Acres within ACEC Not Meeting	842	581	260
Unknown	0	5	0

*Meeting with Problems is reported as Meeting Land Health Standards.

Environmental Consequences:

Proposed Action **–** The proposed management actions are targeted to stop continued degradation through adjustments in carrying capacities (AUMs) to match forage availability, limiting early spring use unless a grazing strategy is in place, and adjustments in utilization from 50% to 35%. Changes are expected to improve vegetative vigor, improve low cool season perennial basal cover, allow for seedling recruitment, and overall perennial plant basil cover. The allotments are anticipated to make slow incremental steps over the next 25-100 years towards static to upward trends which will move the allotment(s) towards meeting Land Health Standards without total removal of livestock grazing and by association address the relevant and important values within the ACEC.

The proposed action addresses indirect and direct impacts concerning livestock grazing management within the ACEC and in the associated allotments. For additional effects analysis concerning the relevant and important values of the ACEC, see the T&E plants section, recreation section for unique scenic qualities and soil section for erosion.

*Alternative 2 (no grazing)**:*** Removing grazing from the North Delta land health area would eliminate the direct effects and reduce the indirect impacts to Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) from grazing. The vegetation community problems that most likely threaten Colorado hookless cactus populations or contribute to the suppression of populations such as exotic plant competition, low native vegetation diversity, low shrub cover, low shrub vigor, and the presence of noxious weeds would slowly improve with the reduction in reduction in forage use. With limited precipitation and 120 years of grazing disturbance, improvement in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat would take place over the next 120 ±years. Other disturbances from rights-of-ways, OHV and wildlife would continue to impact Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) and its habitat.

No Action Alternative (current management) –T&E species in the Adobe Badlands ONA/ACEC is one of the major constituents for the creation of this ACEC, and Colorado hookless cactus (*Sclerocactus glaucus)* is the main species of concern. Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Allotments with acres meeting land health standards would continue to do so under this action, while allotments with acres meeting with problems with static trends, would remain stable. Allotments with acres meeting with problems, that have downward trends, would continue to degrade, and acres not meeting standards would remain static and/or increase. This action would not promote the relevant and important values of the ACEC. In addition, this action is not in accordance with CFR §4180.1 Fundamentals of Rangeland Health. Direct and indirect impacts would be expected to continue at similar levels depicted in the current LHA.

WILD AND SCENIC RIVERS

Affected Environment:

A segment of the Gunnison River adjacent to the North Delta grazing unit has been determined to be "eligible" for inclusion in the National Wild and Scenic River System (NWSRS). The full Eligibility Report with detailed information on the inventory and determination process can be found on the BLM Uncompahgre Field Office website here: www.blm.gov/style/medialib/blm/co/field_offices/uncompahgre_field/rmp/rmp_docs.Par.16348.File.dat/Final%20WSR%20Eligibility%20Report%20Final%20Web%20071210.pdf

The name of the relevant eligible river segment is Gunnison River, Segment 2. The segment has a tentative classification of "recreational." This means that there are few constraints on the level of development and modification of the lands adjacent to the segment within a quarter mile of either side of the segment.

The outstandingly remarkable value (ORV) is "fish", and specifically, the Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*). Both species are classified as endangered under the Endangered Species Act and are known to inhabit this segment. In addition, this section of water supports predominantly native fish species, including exemplary populations of three BLM and Colorado sensitive species: flannelmouth suckers (*Catostomus latipinnis*), bluehead suckers (*Catostomus discobolus*), and roundtail chubs (*Gila robusta*).The river in the segment is free-flowing and the water quality is sufficient to support the fish ORV. BLM Manual 6400 details the policy guidance for managing eligible river segments. It requires BLM to manage the segment to protect the free-flowing nature of the river, its tentative classification (recreational), and the ORV (fish) until a determination is made to carry the segment forward for study as a "suitable" segment or it is released from further study.

Environmental Consequences:

Impacts Common to all Alternatives

It is likely that under all alternatives rain, snowmelt and irrigation, return flows originating on the Mancos shale uplands, would continue to carry salts and selenium derived from those soils into the river segment. This would continue to negatively impact the water quality of the segment, however, the contribution from the lands in the North Delta grazing unit is a very small fraction of the total contribution from the entire watershed. (Refer to the Water Quality and Aquatic Wildlife sections of this document for more detailed analyses.)

Proposed Action – There would likely be no discernable impacts to water quality or the ORV. There would be no impacts to either the tentative classification of this segment or its free-flowing nature. (Refer to the Water Quality and Aquatic Wildlife sections of this document for more detailed analyses.)

Alternative 2 –There would likely be no discernable change to impacts to water quality or the ORV. There would be no impacts to either the tentative classification of this segment or its free-flowing nature. (Refer to the Water Quality and Aquatic Wildlife sections of this document for more detailed analyses.)

No Action Alternative – There would likely be no discernable change to impacts to water quality or the ORV. There would be no impacts to either the tentative classification of this segment or its free-flowing nature. (Refer to the Water Quality and Aquatic Wildlife sections of this document for more detailed analyses.)

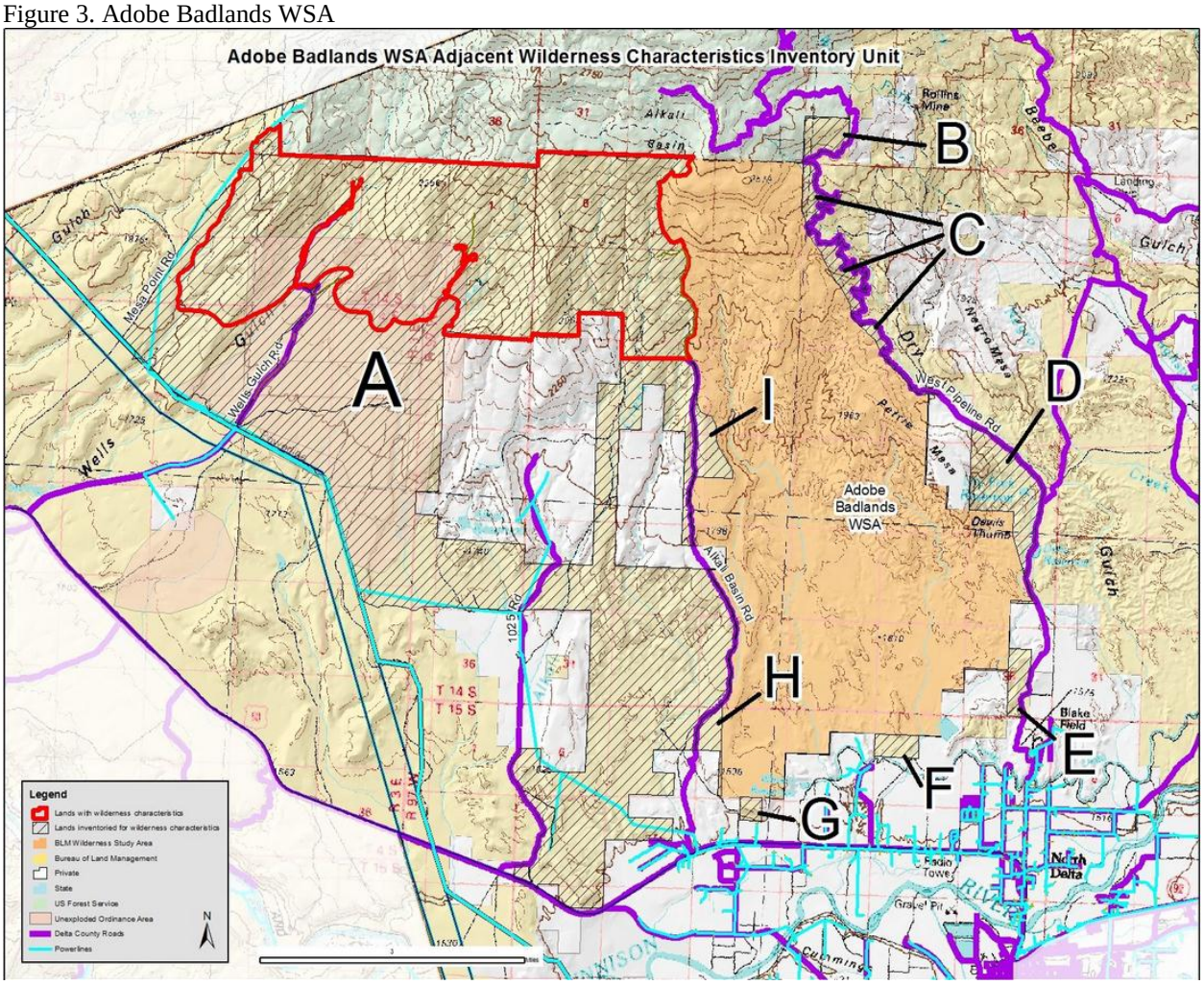
LANDS WITH WILDERNESS CHARACTERISTICS

Affected Environment:

BLM completed an updated inventory of lands with wilderness characteristics within the Uncompahgre Field Office in 2015. The webpage with all the details can be found here: **http://www.blm.gov/co/st/en/fo/ufo/uncompahgre_rmp/lwc_inventory.html**.

One unit within the North Delta project area was found to possess wilderness characteristics – Adobe Badlands WSA Adjacent Wilderness Characteristics Inventory Unit, Figure 3.The wilderness characteristics assessment can be found here: http://www.blm.gov/style/medialib/blm/co/field_offices/uncompahgre_field/documents/lwwc_docs.Par.18241.File.dat/2015-04 UA Adobe Badlands WSA Adjacent.pdf.

Figure 3. Adobe Badlands WSA



The unit (outlined in red above) has been determined to possess wilderness characteristics, including adequate size, naturalness, outstanding opportunities for solitude and primitive and unconfined recreation, and supplemental values. The inventory process was conducted consistent with BLM policy guidance in BLM Manual Section 6310.

The existing RMP does not address management of lands with wilderness characteristics, so any project proposals relative to livestock grazing in the area would be considered regardless of their potential affects to wilderness characteristics. BLM would apply BMPs to any proposal (including those that would moderate impacts to wilderness characteristics), but no proposal would be off the table solely on the basis of impacts to wilderness characteristics.

Environmental Consequences:

Impacts Common to all Alternatives There are no impacts common to all alternatives. The proposed action could potentially lead to impacts to wilderness characteristics. Alternative 2, would likely result in gradual, small scale increases in acreage of lands possessing wilderness characteristics. Since wilderness characteristics exist, and are relatively stable under current grazing practices (no action alternative), there would be no impact from the no action alternative.

Proposed Action – The Adobe Badlands WSA Adjacent wilderness characteristics unit was found to possess characteristics while under current grazing management. Although under the proposed action there would likely be slight, incremental improvements land health, there would likely be no discernable effect on wilderness characteristics.

Alternative 2 Under this alternative there would be no grazing. It is likely that in the long run there would be gradual, small scale increases in acreage of lands possessing wilderness characteristics.

No Action Alternative - The No Action alternative would continue with current grazing management. Under current management the area possesses wilderness characteristics as currently inventoried. Continuation of current grazing management would have no impact on size or quality of characteristics in the inventory unit.

CULTURAL RESOURCES

Affected Environment:

The 1998 BLM/Colorado SHPO Protocol agreement requires the BLM to identify all historic properties and sacred sites on all lands within Colorado that are within the Area of Potential Effect (APE) of a BLM undertaking (1998 Protocol VII (A) p. 4), which is defined as the geographic area(s) within which an undertaking may cause changes in the character or use of historic properties (36 CFR 800.2). During Section 106 review, a cultural resource assessment was completed for this allotment in November and December 2014, following the procedures outlined in IM-WO-99-039, IM-CO-99-007 and IM-CO-99-019. Copies of the cultural resource assessment are available in the Uncompahgre Field Office archaeology files and the summary report is attached to the range allotment permit file.

The North Delta area encompasses a limited range of cultural resources ranging from the recent historic to the earliest Paleo-Indian periods. The topography and landscape contributes to the "low potential" of this zone, being composed mainly of Mancos Shale lowlands with few water resources. Archaeological sites in the area are comprised mostly of isolated finds, limited lithic scatter/resource procurement sites and evidence of historic ranching and development. There are few known National Register eligible sites within the North Delta LHA unit. In general, archaeological sites in the vicinity are in stable condition, and vandalism is low – mainly due to the area's lack of accessibility. Casual surface collection remains a problem.
In the more remote backcountry, site disturbance is usually limited to erosional factors, some damage from cattle grazing (nearly all of which is from the past) and inevitable aging factors.

Environmental Consequences/Mitigation:

Impacts Common to all Alternatives-Direct impacts that may occur, where livestock concentrate and include trampling, chiseling and churning of site soils, cultural features and artifacts, artifact breakage and impacts from standing, leaning, and rubbing against above ground features and rock art. Indirect impacts may include, soil erosion, gullying and increased potential for unlawful collection and vandalism. In areas where cultural site presence coincides with areas of livestock concentration, continued grazing may contribute to substantial ground disturbance and cause cumulative, long term, irreversible adverse effects to historic properties.

Proposed Action – Effects from Grazing - The North Delta grazing permit renewals for 2015 contain nine individual allotments which have been analyzed for the presence of cultural resources which may be impacted by cattle grazing. All of the allotments have been examined and the appropriate reports are on file in the cultural files, BLM, Uncompahgre Field Office.

Allotment 14004 - South Branch. Cultural Resources Information for Range Allotments form on file (02UN – 004). Class II work required for the initial evaluation was completed in 2001, and it is recommended that the permit be renewed with no further work required.

Allotment 14016 – Wells Gulch. Cultural Resources Information for Range Allotments form on file (01UB – 113). Evaluations were completed and it is recommended that the permit be renewed with no further work required.

Allotment 14017 – Alkali Flats. Cultural Resources Information for Range Allotments form on file (00UN – 154). The permit was renewed in 2000 with further work required. Inventories were completed in 2003 (Frank Stipe, 2003 – report on file) and renewal is recommended with no further work required.

Allotment 03277 – Pipeline. This allotment was evaluated as the "Pipeline Pasture" of the Alkali Flats allotment, and a report is on file (00UN – 153). The permit was renewed in 2000 with further work required. Inventories were completed with negative results in the fall of 2000 (Fike 2000, report on file) and renewal is recommended with no further work required.

Allotment 14019 –Deer Basin/Midway. Cultural Resources Information for Range Allotments form on file (01UB – 111). Renewal is recommended with no further work required.

Allotment 14021 – Point Creek. Cultural Resources Information for Range Allotments form on file (01UB – 112). Renewal is recommended with no further work required.

Allotment 14022 – Petrie Mesa. Cultural Resources Information for Range Allotments form on file (02UN – 003), with further action required. Class II work required for the initial evaluation was completed in 2001 (Botsford 2001 report on file), and it is recommended that the permit be renewed with no further work required.

Allotment 14023 – Dirty George. Cultural Resources Information for Range Allotments form on file (02UN – 002). Renewal is recommended with no further work required.

Allotment 14025 – Ward Creek / Doughspoon. Cultural Resources Information for Range Allotments form on file (99UB – 087). Renewal is recommended with no further work required.

These allotment reports were completed between 1999 and 2002 with no further work recommendations, or with some recommendations which were subsequently fulfilled and reports issued. Currently, there are no potentially 'at risk' historic properties located in areas of potential livestock concentration. Previously identified properties have been monitored and will continue to be field visited to assess livestock grazing impacts. As currently constituted, there will be no impacts to any known or anticipated historic property from the issuance of these grazing permits.

Mitigation Measures - Appropriate mitigation measures may be identified in consultation with Colorado SHPO upon discovery and within the ten year period of this permit. It is recommended a renewal be issued for these grazing allotments subject to the allotment specific stipulations contained in the information forms.

Alternative 2-Effects from Grazing, there would be no effects to any cultural resources if the no grazing alternative were adopted.

No Action Alternative **–** Effects from Grazing, existing impacts would continue as they are, and no change would be expected. Since all the allotments analyzed above, exhibit no change and have been recommended as "Renewal with No Further Work", no additional impacts would be expected aside from those effects noted within each allotment specific form.

Cumulative Impacts **–**Cumulative impacts to cultural resources have been analyzed in each specific allotment form. Since most impacts from grazing are cumulative in nature, the analyses are complete and no additional cumulative impacts are anticipated beyond those found in any allotment specific analysis as above.

NATIVE AMERICAN RELIGIOUS CONCERNS

Affected Environment:

The North Delta LHA area is not known to include any locality of special interest to the Northern Ute, Southern Ute or Ute Mountain Ute Indian Tribes. Consultation may be initiated concerning any potential use conflicts or impacts. Management, planning and project specific assessments for these areas should be assumed to require Native American Consultation with the appropriate tribal entities.

The locality addressed in this EA was historically home to large numbers of Ute people of the Uncompahgre band, and some areas may be considered both religiously significant, and traditionally important to modern day Ute people. There are no known Traditional Cultural Properties or significant cultural value localities within the LHA. The BLM has consulted with representatives from the Uintah and Ouray (Northern) Ute tribe, Southern Ute Tribe and the Tribal Historic Preservation Office of the Ute Mountain Ute Tribe.

Environmental Consequences/Mitigation:

Proposed Action - Previous consultations have revealed limited localities which could be impacted by grazing activities. On-site visits have been conducted and there are no observed impacts to Native American Religious Concerns. Should monitoring of these localities result in the identification of impacts to religious or cultural values, the appropriate mitigation steps will be undertaken in consultation with representatives from the interested tribes.

Alternative 2 Effects from Grazing, under the no grazing alternative there would be no effects to any Native American Religious concerns

No Action Alternative – Effects from Grazing, if the permits are renewed without further changes, there would be no changes to existing practices, and no impacts are anticipated**.**

Cumulative Impacts **–**Cumulative impacts to Native American Religious Concerns may be analyzed in each specific allotment form. Since most impacts from grazing are cumulative in nature, the analyses are complete and no additional cumulative impacts are anticipated beyond those found in any allotment specific analysis as above.

SOILS (includes a finding on Standard 1)

Affected Environment:

The analysis area for impacts to soils includes the North Delta LHA area where direct effects occur. However, some of the indirect and cumulative effects occur downstream as soils are eroded from the site and carried downstream. The scope of the analysis for indirect and cumulative effects includes the reaches of the Gunnison River where each of the three LHA areas and their drainages meet the river.

Soils on public lands in the North Delta LHA vary in parent material from the marine evaporate sediments of the Mancos Shale to the sedimentary sandstone and shale units of the Dakota, Morrison and Mesa Verde formations. Most of the soils are dominated by sandy and silty clay loams and are covered by a thin veneer of gravels, cobbles and boulders left behind from glacial outwash. Some parts of the area are also covered with boulders and cobbles comprised of volcanic basalt mobilized by glacial action off the top of Grand Mesa. More precise descriptions of the soils in the area are in the table below from the Paonia and Ridgway Soil Surveys (USDA, Natural Resources Conservation Service). Only those soil units 1000 acres or larger, are included in the Table 10.

Table 10.Soil Descriptions and Associated Ecological Sites

Soil Unit Name	Geomorphic Description	Texture	Ecological Site Type	Soil Erodibility (Kw) Higher=More Erodable (0.2-.69)	Runoff Potential	Acres
Badland	flood plains, gullies, hillsides, uplands, valleys	unweathered bedrock		0	Very high	17354
Utaline-Torriorthents complex	benches, mesas, pediments	stony loam	Stony Saltdesert	0.2	High	10327
Saraton-Agua Fria complex, 20 to 50 percent slopes	benches, mesas, terraces	gravelly loam		0.28	High	7958
Meeteetse stony loam, 3 to 20 percent slopes	alluvial fans, terraces, uplands	stony loam	Stony Saltdesert	0.2	Very high	7118
Utaline sandy loam, 3 to 12 percent slopes	fans, mesas, terraces	sandy loam	Stony Saltdesert	0.28	Medium	5207
Rock outcrop	benches, canyons, escarpments, mesas, uplands	unweathered bedrock		0	Very high	3805

Soil Unit Name	Geomorphic Description	Texture	Ecological Site Type	Soil Erodibility (Kw) Higher=More Erodable (0.2-.69)	Runoff Potential	Acres
Shavano-Lazear complex, 3 to 12 percent slopes	uplands	fine sandy loam	Loamy Saltdesert	0.28	High	3462
Torriorthents-Rock outcrop, sandstone, complex	mountains	very stony loam		0.15	High	2221
Gullied land	drainageways, flood plains	variable		0	Medium	1844
Persayo silty clay loam, 12 to 35 percent slopes	uplands	silty clay loam	Silty Saltdesert	0.32	Very high	1782
Billings silty clay loam, 0 to 3 percent slopes	fans, flood plains	silty clay loam	Salt Flats	0.32	Medium	1611
Utaline stony loam, 3 to 30 percent slopes	fans, mesas, terraces	stony loam	Stony Saltdesert	0.2	Medium	1566
Billings silty clay loam, gullied, 0 to 6 percent slopes	fans, flood plains	silty clay loam	Salt Flats	0.32	Medium	1496
Lazear-Rock outcrop complex, 3 to 30 percent slopes	uplands	gravelly loam	Saltdesert Breaks	0.2	Very high	1104
Chipeta silty clay, 3 to 30 percent slopes	uplands	silty clay	Clayey Saltdesert	0.24	Very high	1046
Delson very stony loam, 20 to 60 percent slopes	mountain slopes	very stony loam	Deep Clay Loam	0.1	Very high	1046
Glenton fine sandy loam, 0 to 3 percent slopes	fans, stream terraces	fine sandy loam	Sandy Saltdesert	0.28	Very low	1008

Natural erodibility is rated by the NRCS and quantified by the soil erodibility factor (Kw). The Kw factor indicates the susceptibility of a soil to sheet and rill erosion by water. The estimates are based primarily on percentage of silt, sand, clay, organic matter and soil structure. No vegetative or slope component is factored into the erodibility factor. In the table above, the higher the erodibility factor, the more susceptible the soil is to sheet and rill erosion by water. There are 5,863 acres with a Kw factor of 0.32 or greater. These soils have textures with very little rock content and higher percentages of silt and clay and can easily be eroded by water. There are 55,324 acres with a Kw factor less than 0.32. These soils have characteristics such as, stoney loam, gravelly loam, and unweathered bedrock and are less likely to be eroded by water. Much of the area is covered by glacial and volcanic basalt rock. This material provides protection for soil surfaces on many of the mesas and terraces. Those soils that don't have the rock veneer, are approximately 8% of the soils in the area, and are at greater susceptibility to erosion due to the natural physical properties of the soil.

The North Delta Land Health Assessment (2011) evaluated soils to determine if they were meeting, meeting w/ problems, or not meeting land health standards. Assessment of soil health is conducted using the following indicators: evidence of excessive rills and pedestals, active gullies, appropriate groundcover and plant canopy cover (including biological soil crust), adequate plant litter accumulation, minimal litter movement, appropriate soil organic material, and plant species diversity and presence of vigorous, desirable plants. These are the factors in combination with slope and rainfall that largely control the erosion processes. There were 33,410 acres found to be meeting land health standards and 23,165 acres found to be meeting with problems while 3,965 acres were not meeting. The remaining acres in the unit were not evaluated in part because they consisted of land features that were difficult to assess such as rock

outcrops and cliff bands. Approximately 43% of the soils in the unit are meeting with problems or not meeting.

In drier portions of the unit, biological soil crust (BSC) is an important component of the plant community needed for stabilizing soils more susceptible to erosion. Biological soil crust is most prevalent in portions of the field office that receive less than 14 inches of annual precipitation, and on terrain with less than a 25-percent slope. In areas receiving more than 14 inches of annual precipitation, competition from vascular plants reduces the occurrence of biological soil crust.

Livestock can impact biological soil crusts by direct trampling. BSCs help stabilize the soil and inhibit wind and water erosion by forming a blanket or mat covering and binding the soil surface. BSC is a complex mosaic of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria. The crusts also serve a critical role in nutrient cycling, water infiltration, and seedling germination[8]. The lack of biological soil crust was identified as a problem in the land health assessment (LHA) on 8,973 acres or approximately 15% of the acres assessed.

If soils become severely impacted from disturbance or during dry periods and native perennial vegetation and soil crust is degraded, annual weeds such as cheat grass can become dominate. Annual vegetation provides soil stabilization for a short period of time compared to perennials and prevents soil crust establishment by forming a dense monoculture of tightly spaced plants[9, 10]. The LHA identified 44,952 acres with invasive or noxious species identified as a problem or 73% of the acres assessed.

Any disruption of the plant community or biological soil crust can lead to accelerated erosion. The LHA found 3,090 acres or 11% of soils to be meeting with problems or not meeting land health standards where they are also naturally susceptible to erosion (Kw >0.31). Alternatively, the LHA found 23,103 acres or 85% to be meeting with problems or not meeting land health standards where the soils are less susceptible to erosion (Kw <0.28). This would indicate the physical properties of the soils may be a cause in 11% of the soils in poor condition. Other causal factors are contributing to the poor land health soil conditions.

Causal factors are collected at the upland study sites during the field sampling portion of the LHA and were identified by comparing evidence of human-related or notable natural influences between sites meeting health standards versus those with land health problems. Some of the causes cited are historic grazing, current grazing, drought, nearby agriculture and residential. There were 11,234 acres or 41% of soils not meeting or meeting with problems where current grazing was cited as a causal factor. The causes for land health conditions are often complicated by multiple causal factors such as drought, historic grazing, proximity to BLM routes and trailing routes. Those factors are certainly contributing to the soil health problems in the unit, as well as physical soil characteristics in 11% of the soils, however, current grazing and historic grazing are the largest contributor to poor soil health in 77% of soils not meeting or meeting with problems.

The 2012 Land Health Assessment analyzed trends from the previous assessment in 2002 to determine if conditions are improving or declining with current management. Using statistical t-tests, Standard 1 Determinations have improved slightly since the preceding Land Health Assessment of 2001-2002. Lands rated as meeting Standard 1 have increased by 6%, and lands

meeting Standard 1 with problems have decreased by 8%. However, lands not meeting have increased by 4%. Many of the lands determined to be meeting with problems and not meeting in the last LHA were vulnerable to increased soil erosion because of high levels of bare, unprotected soil, and low plant basal cover. In 2012, many of those areas remained in poor condition with high levels of bare soil and low basal cover as well as low litter cover and low cryptogam cover.

Alkali Flats, Deer Basin-Midway and Dirty George allotments all have 50% or greater of the area meeting with problems or not meeting. The specific indicators of concern are low litter cover and high levels of bare soil. These sites are largely on Mancos Shale and receive approximately 8" inches of precipitation annually. Disturbance on these sites is difficult to recover from before invasive species become dominant.

Environmental Consequences:

Impacts Common to all Alternatives- Soils rarely benefit from disturbance and grazing represents a routine disturbance of direct impact by hoof action. Direct impacts can be readily seen in the contours left on hillsides where livestock use the same trails around terrain features. Where contours merge, runoff is concentrated and soils are mobilized downslope. Sediment production on Mancos Shale is increased 10 times once it has been disturbed[11].

Indirect impacts include mobilization of soils during rainfall-runoff events. Once soils are dissolved and suspended in water they can contribute to existing concentrations of salinity, selenium, sediment and bacteria. See the Surface Water section for further description.

Routine grazing can also cause indirect effects to soils by reducing plant basal cover as well as promoting the conversion of plant species to invasive short lived annuals that provide little cover. Despite these direct and indirect impacts, routine grazing can be managed at appropriate levels to maintain land health conditions at a level of "meeting." For example, the wells gulch allotment was assessed in 2012 and found to be meeting on 96% of the allotment and meeting with problems on 4%. The trend since the last assessment in 2002, is static on 94% of the allotment and down on 4%. The Delta Pipeline, Point Creek and Wells Gulch allotments are all meeting with static trends and are assumed to continue to meet even under the no action alternative with continuation of existing management. Therefore, only the allotments not meeting or meeting with problems will be analyzed. Acres impacted and the design features of each alternative will be used to determine how the existing problems would be impacted.

In the proposed action and the no action alternatives, reduction in impact is expected due to changes in the permit or removal of grazing from the landscape. However, the projected recovery period for any type of reduction in impact to biological soil crust could be as little as 25 years or as much as 50 years depending on site stability, effective precipitation and continued disturbance regimes[110].

Proposed Action – The entire Alkali Flats allotment either meets with problems or does not meet land health standards. The proposed action reduces the average 10 year actual use AUMs by 30% as well as utilization levels and implements delineated use areas with periodic rest. This

will result in direct reductions in hoof impact compared to the no action alternative on 4,772 acres of soils with high levels of bare soil and low cryptogam cover.

The Deer Basin-Midway allotment meets standards on 49% of the allotment, meets with problems on 25% and does not meet land health standards on 26%. The proposed action reduces the average 10 year actual use AUMs by 30% and reduces utilization levels from 50% to 35%. This will result in direct reductions in hoof impact compared to the no action alternative on 3,044 acres of soils with high levels of exotic plans, low cryptogam cover and low plant basal cover.

The Dirty George allotment meets on half and meets with problems on half of the allotment. The proposed action does not change the Active AUMs or utilization levels. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative to resolve the exotic plants and bare soils found as problems in this allotment. The indicated causes of the problems were from wildlife use and historic grazing.

The Petrie Mesa allotment meets on 71%, and meets with problems on 21% of the allotment. The proposed action reduces the average 10 year actual use AUMs by 30% as well as utilization levels from 50% to 35% and implements delineated use areas and a new grazing strategy. This will result in direct reductions in hoof impact compared to the no action alternative on 766 acres of soils with high levels of bare soil, exotics and low cryptogam cover.

The South Branch allotment meets on 52% and meets with problems on 45% of the allotment. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative to resolve the exotic plants and bare soils found as problems in this allotment. The indicated causes of the problems were from wildlife use, BLM roads and use as a stock driveway.

The Ward Creek-Doughspoon allotment meets on 39% and meets with problems on 59% of the allotment. The proposed action does not adjust the Active AUMs but does reduce the utilization levels from 50% to 35%. This will result in some direct reductions in hoof impact compared to the no action alternative by preventing livestock from staying in any one area very long. The existing problems include runoff drainages, bare soils and exotics. The causes are from an open OHV area, rights-of-ways, old contour furrow treatments, and historic grazing. The proposed action is unlikely to impact the existing problems.

Alternative 2 (no grazing) Removing grazing from the North Delta land health area would reduce the direct and indirect impacts from grazing. The problems such as low cryptogram cover, bare soils, and low plant basal cover would slowly improve with the reduction in hoof action and reduction in forage use. With limited precipitation and 120 years of grazing disturbance, improvement in soil health would take place over 25-50 years. Other disturbances from rights-of-ways, OHV and wildlife would continue to impact soils.

No Action Alternative – Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Direct and indirect impacts would be expected to continue at similar levels.

Finding on the Public Land Health Standard for upland soils:

Current land health conditions rate soils in the North Delta land health unit as meeting on 33,410 acres, meeting with problems on 23,165 acres, and not meeting on 3,965 acres. Acres meeting and meeting with problems are reported as meeting land health standards. The proposed action would reduce direct and indirect impacts to soils and result in an upward trend in soil health conditions.

VEGETATION (includes a finding on Standard 3)

Assumptions:

The ecological site(s) with the greatest acres, within the allotment, will drive the majority of adjustments in livestock management on allotments.

Percent acres impacted and the design features of each alternative will be used to determine how existing vegetation issues will be addressed.

In analysis of data, higher confidence levels, higher precision and greater variability all dictate large sample sizes. Based on the importance of the data obtained and the resources available to do the necessary sampling a small sample size may be used however, a significant difference (range deterioration) may exist but may not be detected. Therefore, BLM assumed the level of significance at p= 0.2 and the confidence interval of 80%, instead of the widely use p=0.05 and 90-95% confidence interval. The above precision and confidence interval were applied in the analysis to lower the chances of not detecting a change, due to the small sample size, and the need to detect range deterioration[12].

Acres meeting standards, or meeting with problems, are recorded and reported as meeting land health standards.

Indicators: Percent Land Health Standard 3 Vegetation-acres meeting, meeting with problems, and not meeting.

Affected Environment:

The analysis area for impacts to vegetation includes the North Delta LHA area where direct effects occur. However, some of the indirect and cumulative effects occur in 2 adjacent LHA units as the same type of grazing use occurs within those areas. The scope of the analysis for indirect and cumulative effects includes three Land Health Units, North Delta, Dominguez Escalante, and Gunnison Gorge (Table 11).

Vegetation on public land varies from one vegetation community to another depending on soil characteristics that give each community its own ecological characteristics known as the ecological site description or range site description. The largest common vegetation communities across the three land health units include: Pinyon Juniper types with 174,325 acres (36%), salt-desert shrub types with approximately 166,010 acres (34%), Mountain Shrub with 62,109 acres (13%), and Sagebrush with 60,314 acres (12%). Within the North Delta Land Health unit Pinyon Juniper comprises 8,927 (14%) acres and the salt-desert shrub community totals 49,209 (76%) acres. Other vegetation communities are present, but either comprise too small of a percent public land to drive management changes, are private, or are being analyzed under another standard i.e. riparian.

A majority of this landscape unit has concerns and issues with Standard 3. These concerns are most pronounced in the salt-desert shrub communities. The vegetation of salt-desert shrub communities are characteristically sparse, with optimal ground cover 30%, and should largely be dominated by cool and warm season grasses, shrubs, in addition to annual and perennial forbs.

The most concerning indicators within the LHA unit include exotic invasive plants, low perennial cool season grass cover, low perennial forb cover, low native plant diversity, limited areas of low perennial warm season grass cover, low shrub vigor and cover, and heavy shrub hedging.

Based on historical information both of these vegetation types (Pinyon Juniper and Salt-Desert Shrub) have altered herbaceous vegetative communities which has partly been attributed to the amount of livestock introduced into the west during settlement. The original grazing capacity of salt desert shrub communities were approximately 5 acres/AUM but has changed to a minimum requirement of about 18 acres/AUM[13]. Will C. Barnes (Forest Service's Chief of Grazing) in 1926 put it this way "this is a clear case of first come first served and the devil take the hind-most." To attempt to address this uncontrolled use the Taylor Grazing Act, as passed in 1934 and which sought to "stop injury to the public grazing lands by preventing overgrazing and soil deterioration; provide for their orderly use, improvement, and development; and to stabilize the livestock industry dependent upon the public range". This was the start of grazing management on public rangelands, which continued through the years with various changes most notably the passing of Federal Land Policy and Management Act of 1976 (FLPMA), and the Rangeland Grazing Reform Act of 1993.

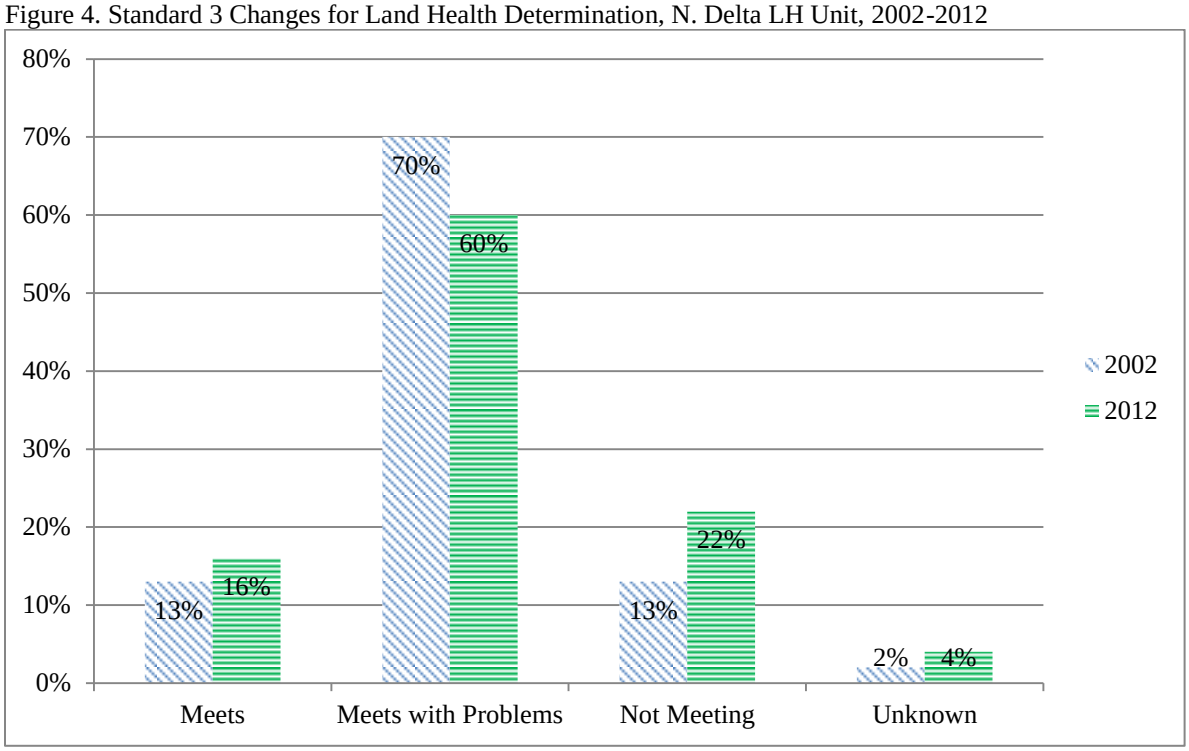
Many of the land health problems in the three land health units are due to the legacy of heavy use and degradation caused many years ago. The semiarid climate, relatively fragile vegetation, and soils which are slow to recover from disturbance, combined with historical heavy use (not just grazing), changes in the stability of ecological sites, and changes in vegetative composition, has hampered BLM's ability to bring about change in these fragile environments. Nevertheless, due to past and some current unintentional mismanagement of grazing, there continues to be concerns with the salt desert shrub community associated with the stony salt desert ecological site and other ecological sites that support the salt desert shrub vegetation community. The health status of vegetation and long term trends within the salt-desert shrub community are a direct reflection of habitat conditions needed for TES species, soil health, AUM availability, esthetics, and the support of all facets of BLM's multi-use mission. The pinyon juniper communities are largely meeting across all three land health units. Table 11and Figure 4 below depict current and prior land health status across the three land health units.

Table 11. Land Health Units

Land Health Unit Comparison[1]			
LHA Units	Standard 3 Vegetation		
	Meets	[2]Meets with Problems	Not Meeting
North Delta	16% (13%)	60% (70%)	22% (13%)
Escalante	64% (43%)	17% (28%)	8% (24%)
Gunnison Gorge	53% (45%)	29% (45%)	11% (5%)

[1]Parentheses note 2002 LHA unit results. [2] Meeting with problems is reported as acres meeting land health standards.

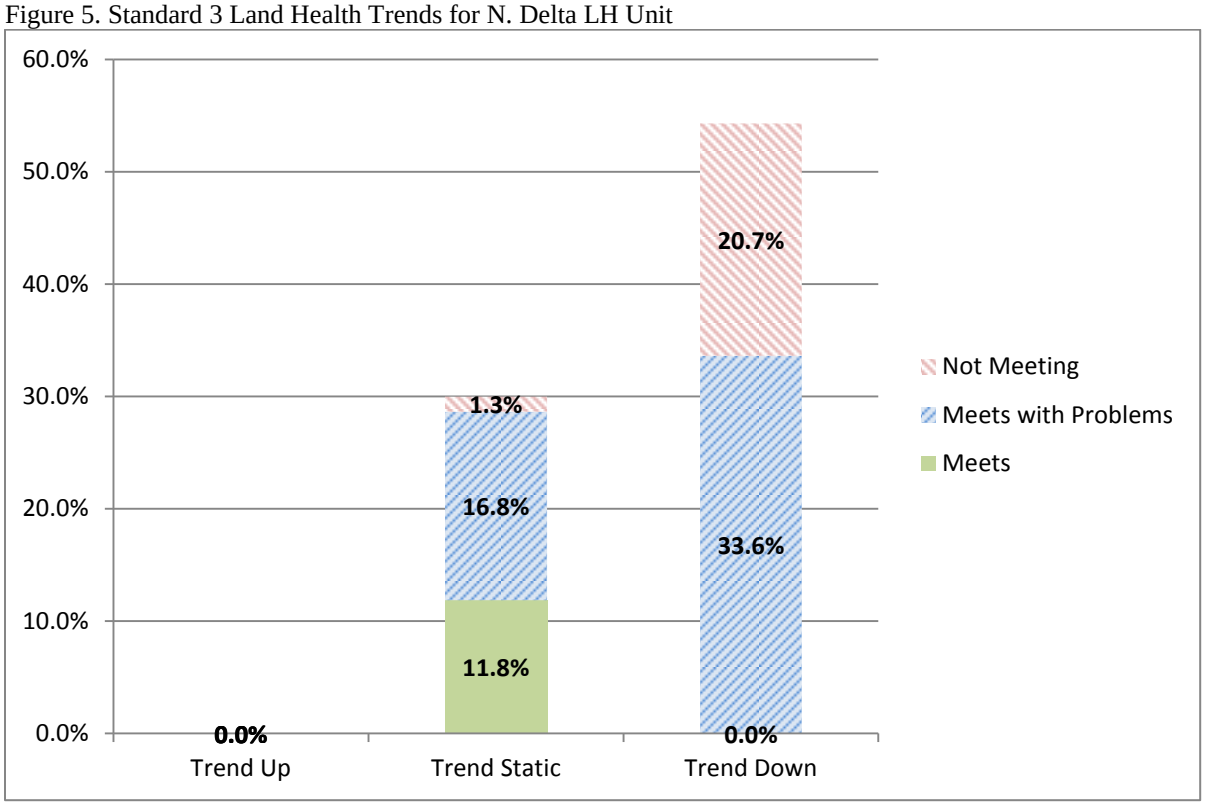
Figure 4. Standard 3 Changes for Land Health Determination, N. Delta LH Unit, 2002-2012



*Acres meeting with problems are reported as meeting land health standards.

Within long term trend categories, in the N. Delta LH unit, there are no acres in upward trend within trend categories. Although there were small changes in the land health meet category (3%), trends across the unit are not improving. Trends across the unit shows land health standards, within trend, are meeting 11.8% of the acres, 16.8% are meeting with problems" and 1.3 % are not meeting. Downward trends across the land health unit show 0% of these acres are meeting LHS while 33.6% are meeting with problems and 20.7% are not meeting. In addition, more than half the unit acres are showing downward trend (54.3%) from 2002 to 2012.

Figure 5. Standard 3 Land Health Trends for N. Delta LH Unit



Overall, long term trends within LH category for the North Delta LH unit are static in areas meeting land health standards (74%), land meeting with problems have a little over half the acres depicting downward trends (56%), and acres not meeting are expressing downward trends on the majority of acres (94%) (Table 12).

Table 12. Trend by Land Health Category

North Delta Land Health Unit Trends by Land Health Category				
	Standard 3 Vegetation			
Current Assessment	Total Acres within Meets Category	Total Acres within Meets with Problems	Total Acres within Not Meeting Category	*Trend across all N. Delta LH Unit Acres
Trend Up	0%	0%	0%	0%
Trend Static	74%	28%	6%	30%
Trend Down	0%	56%	94%	54%

Trends are based on percent of acres for each category. *Approx. 15% of the total acres within N. Delta LH Unit are unknown for trend.

In addition, to the larger landscape unit being evaluated for land health standards, determination and trends were evaluated and analyzed for each allotment within the North Delta land health unit and results are presented below.

Alkali Flats # 14017

The Land Health Assessment done in 2013 for this allotment indicates, it is not meeting (64%) and meeting with problems (35%), for approximately 99% of the allotment. Of this, current livestock management was found to be one of the significant causal factors, on 78% of the allotment (Delta LHA, 2014). Concerns noted, from the latest LHA, were a low occurrence of perennial shrubs, perennial cool season grasses, and perennial forbs, in relation to the Ecological Site Descriptions, and the last LHA (2002) completed. The largest ecological site in the allotment is stony salt desert, with 4,799 acres, other ecological sites include, clayey foothill (60 ac), clayey salt desert (204 ac), salt flats (952 ac), and silty salt desert (668 ac), and when combined with a lands that do not have an ecological site attributed, adobe badland, (2,269 ac) total the remaining evaluated acres in the allotment.

The stony salt desert ecological site should have an optimum ground cover of about 30 %, with perennial grasses contributing about 60% of the species composition and 18% of the vegetative cover, split evenly between cool and warm season, shrubs should contribute about 30% species composition and 9% vegetative cover, with forbs comprising about 10% of the species composition and 3 % vegetative cover. The current LHA suggests, the allotment has deviated from what is suggested in the stoney salt desert ecological site description, with forbs, shrubs, and cool season grasses, considerably lower than the ecological site suggestions. The warm season grass, galleta, is the most dominant grass, and has a higher vegetative cover in most areas than the ecological site description suggests (Table 13).

Table 13. Stoney Salt Desert Site, Site Means and Long Term Trends

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means from 2002/2012		Allotment Long Term Trend
Stony Salt Desert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	13.7%	↓	No significant change (→)
	Cool	30%	9%	1.2%	↓	No significant change (→)
	Warm	30%	9%	12.5%	→	No significant change (→)
Shrub		30%	9%	2.4%	↓	Significant change (↓)
Forb		10%	3%	1.1%	↓	No significant change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment ↑increase, ↓ decrease, →static.

Trend data comparing the current LHA to the 2002 LHA indicates, across the allotment, perennial forb cover has not changed, perennial shrub cover decreased significantly (2% p=0.184), while warm and cool season grass cover has remained static. In addition, exotic species, were noted as having significantly increased in cover (19%), on average (Table 13).

The Land Health Assessment done in 2013 for this allotment indicates, it is not meeting (26%) and meeting with problems (73%), for approximately 99% of the allotment. Of this, current livestock management was found to be one of the significant causal factors, on 40% of the allotment acreage assessed (North Delta LHA, BLM 2012). Concerns recorded, were an overall increase in exotics, decrease in shrub cover, and an overall, decrease in natives, in relation to the ecological site descriptions, current LHA (2012) suggestions, and the last LHA (2002) completed. The largest ecological site in the allotment is stony salt desert, with 4,694 acres, other ecological sites include, clayey foothill (2 ac), clayey salt desert (506 ac), salt flats (989 ac), shallow clay loam pinyon juniper (2,419 ac), and silty salt desert (166 ac), and when combined with a lands that do not have an ecological site attributed, Adobe Badland (3,199 ac), total the remaining evaluated acres in the allotment.

Deer Basin Midway #14019 This allotment has two spatially distinct parcels:

The first parcel is towards the toe of the Grand Mesa, is higher in elevation, and is primarily comprised of the stoney salt desert and shallow clay loam pinyon juniper (NRCS, draft 1996) ecological sites (Table 14 and Table 15). The stony salt desert ecological site, is suggested to have an optimum ground cover of about 30 %, with perennial grasses contributing about 60%, of the species composition and 18% of the vegetative cover. Shrubs contribute about 30% species

composition and 9% vegetative cover, with forbs comprising about 10% of the species composition and 3 % vegetative cover.

The current LHA suggests, the allotment has deviated from what is suggested in the stoney salt desert ecological site description, forb, cool/warm season grass, and exotic plant cover. with forbs and shrubs considerably lower, and warm season grasses notably higher, than the ecological site suggestions. Cool season grasses seem to be in the natural range of variability.

Trend data comparing the current LHA (2012) to the 2002 LHA indicates, this portion of the allotment has remained static, for perennial Perennial shrub cover significantly decreased, (5%, p=0.1055). There were no significant changes, in the percent dead, decadent, or low vigor browse. Causal factors listed include: Rights of Way (not roads), wildlife use current, drought, BLM roads, seral stage issues, and current and historic livestock grazing (Table 14).

Table 14. Stoney Salt Desert Site, Site Mean, and Long Term Trend Upper Section Deer Basin Midway.

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Stony Salt Desert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	29.8%	↑	No Significant difference (→)
	Cool	30%	9%	11.5%	→	No Significant difference (→)
	Warm	30%	9%	18.3%	↑	No Significant difference (→)
Shrub		30%	9%	3.7%	↓	Significant difference (↓)
Forb		10%	3%	0.66%	↓	No significant difference (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from long term trend transects within the allotment ↑increase, ↓ decrease, →static.

The shallow clay loam pinyon juniper sites (Table 15) should have an optimum basil ground cover that ranges from 14% when the tree canopy is at its lowest, 0-15%, to a basil ground cover of 8% when tree canopy is at its highest, > 30%. When tree canopy is lowest, 0-15%, grasses and grasslike species should contribute about 31-71% of species composition and 4-10 % of the vegetative cover, forbs should comprise about 0-3% of the composition and 0-0.30% vegetative cover, and shrubs should contribute about 16-43% composition and 2-6% vegetative cover. When tree canopy is the highest, ≥30%, grasses and grasslike species should contribute about 6-15% of the species composition and 0.48-1.2% of the vegetative cover, forbs should comprise about 0-3% composition and 0-0.24% vegetative cover, and shrubs should contribute about 0-7% compositions and 0-0.56% vegetative cover.

The current LHA suggests, this portion of the allotment has deviated from what is suggested in the shallow clay loam pinyon juniper ecological site description for, forbs and grasses (Table 15). Warm season grasses are within the suggested vegetative cover percent while cool season grasses are considerably lower than the ecological site suggestions. The average canopy cover of

trees on the site is 14.65%, which is on the cusp of splitting categories for tree canopy cover therefore; the site could be compared to a 15-30% tree canopy cover site. In that case, grasses are still below what is suggested for the cover class, and are more closely depicting grass cover on a ≥30% tree cover class. The shrubs would be higher than suggested, and forbs would be just below the range associated with this higher tree cover class. With this said the ecological sites descriptions are suggestions, and shifts in one type of vegetative species, may be influenced from other dynamics of the site, i.e. aspect, and location of transect on the site side slope verses flatter areas etc. Overall this part of the allotment is probably within the range of variability for this type of ecological site.

Trend data comparing the current LHA to the 2002 LHA indicates across this portion of the allotment perennial forb, grass, shrubs and exotic vegetation cover has not changed (Table 15). However, vegetation composition saw a significant increase (5%, p=0.1900) in the percent dead browse species and a significant increase (18%, p=0.0934) in heavily hedged browse. When looking at the causal factors, drought and current/historic wildlife use were noted, while current livestock management use was not identified as a causal factor in this portion of the allotment.

Table 15. Shallow-Clay Loam P/J, Site Mean, and Long Term Trend Upper Section Deer Basin Midway.

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Shallow Clay Loam PJ#110 (draft, NRCS)		Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
0-15% Tree Canopy[2]						
Grass		31-71%	4-10%	0.4%	↓	No Significant Difference (→)
	Cool	31-61%	4-8.5%	0.1%	↓	No Significant Difference (→)
	Warm	0-10%	0-1.4%	0.3%	→	No Significant Difference (→)
Shrub		16-43%	2-6%	5.4%	→	No Significant Difference (→)
Forb		0-3%	2-6%	0.1%	↓	No Significant Difference (→)

Ecological Site [2] Vegetative Cover %=Optimal Ground Cover (14%)*Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from long term trend transects within the allotment ↑increase, ↓ decrease, →static.

The second parcel, is near the Devils Thumb golf course, and is lower in elevation, precipitation, and is primarily composed of the stoney salt desert ecological site, and adobe badland cool slope, which does not have an ecological site associated with this soil type (Table 16 and Table 17). Adobe badland cool slope will be compared to site means across the landscape for this soil type.

The current LHA suggests, the allotment has deviated from what is suggested in the stoney salt desert ecological site description, with forbs, shrubs and cool/warm season grasses, noticeably lower than the ecological site suggestions.

Trend data comparing the current LHA (2012) to the 2002 LHA indicates across the allotment perennial forb, and cool/warm grass cover have not changed however, perennial shrub cover has significantly decreased (5%, p=0.1055) in both ecological sites (Table 16 and Table 17). When looking at the causal factors, drought, noxious weeds, seral stage and current livestock management were noted as significant causal factors associated with the stony salt desert, while drought, dumping, noxious weeds, historic grazing, and new OHV use was associated with the adobe badland areas.

Table 16 Stoney Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Stony Saltdesert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	2.3	↓	
	Cool	30%	9%	0.0	↓	No significant change (→)
	Warm	30%	9%	2.3	↓	No significant change (→)
Shrub		30%	9%	0.7	↓	Significant (↓)
Forb		10%	3%	0.2	↓	No significant change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from long term trend transects within the allotment ↑increase, ↓ decrease, →static.

Table 17. Adobe Badland Cool Slope Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Adobe Badland Cool Slope unattributed (closely resembles Clayey Salt Desert)		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
Grass		N/A	N/A	0	N/A	
	Cool					No significant change (→)
	Warm					No significant change (→)
Shrub		N/A	N/A	11.8	N/A	Significant (↓)
Forb		N/A	N/A	0.3	N/A	No significant change (→)

Adobe Badland Ecological Site will be compared to site means across the landscape for this soil type and aspect.
Trend data is derived from long term trend transects within the allotment ↑increase, ↓ decrease, →static.

Delta Pipeline # 03277

The Land Health Assessment done in 2012 for this allotment indicates, it is not meeting (47%), and meeting with problems (51%), for approximately 98% of the allotment. Of this, current livestock management was found to be one of the significant causal factors on 47% of the allotment (N. Delta LHA, BLM 2012). Concerns recorded, were an increase in exotics, a decrease in perennial shrub cover, low community diversity, and a decrease in perennial forbs, in relation to the Ecological Site Descriptions and the last LHA completed. The largest ecological site in the allotment, is stony salt desert ,with 2,718 acres, other ecological site include, salt flats (5ac), sandy salt desert (86 ac) and shallow and sandy loam pinyon juniper (1,430ac) and when combined with a lands that do have an ecological site attributed adobe badland (1,668 ac), total the remaining evaluated acres in the allotment.

The current LHA suggests, the allotment has deviated from what is suggested in the stoney salt desert ecological site description with perennial forbs and shrubs noticeably lower than suggested. Overall, grass cover is in the range of variability however, the ratio of cool to warm season grass is highly out of the suggested cover percentages. Cool season grasses are considerably lower and warm season grasses are markedly higher than suggested in the ecological site description. With the warm season grass cover notably high, and the increase in exotics, it is plausible perennial forb and cool season grass establishment could be suppressed (Table 18).

Trend data comparing the current LHA to the 2002 LHA indicates, across the allotment perennial forbs and shrubs have significantly decreased (6%, p=0.0098) and (9%, p=0.1959) respectively, while cool and warm season grass cover has not changed (Table 18). The percent dead browse saw no changes, while the percentage decadent browse increased significantly (2%, p=0.1668). In addition, exotic vegetation increased significantly (6%, p=0.1844) across the allotment within this ecological site. When looking at the causal factors, drought, noxious weeds, seral stage, and current livestock management were identified as significant causal factors associated with the stony salt desert ecological site.

Table 18. Stony Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Stony Salt Desert 30% Optimal Ground Cover		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	20.6%	→	No significant change (→)
	Cool	30%	9%	1.3%	↓	No significant change (→)
	Warm	30%	9%	19.3%	↑	No significant change (→)
Shrub		30%	9%	0.5%	↓	Significant (↓)
Forb		10%	3%	0.1%	↓	Significant (↓)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation from Ecological site: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from long term trend transects within the allotment ↑ increased, ↓decreased, →static.

The shallow and sandy loam pinyon juniper #112 site (NRCS, draft 1996) site should have an optimum basil ground cover that ranges from 12%, when the tree canopy is at its lowest 0-15%, to a basil ground cover of 8%, when tree canopy is at its highest, ≥ 35%. When tree canopy is lowest, grasses and grasslike species should contribute about 12-58% of species composition and 1.4-6.9 % of the vegetative cover, forbs should comprise about 0-10% of the composition and 0-1.2% vegetative cover, as shrubs should contribute about 18-57% composition and 2.16-6.84% vegetative cover. When tree canopy is the highest, grasses and grasslike species should contribute about 0-9% of the species composition and 0-0.76% of the vegetative cover, forbs should comprise about 0-10% composition and 0-0.8% vegetative cover, and shrubs should contribute about 0-1% compositions and 0-0.08% vegetative cover (Table 19). The current LHA mean for the site could not be compared to the NRCS ecological site data, as there were not enough transects in the LHA data to create a mean across the LHA area for comparison. However, there is the percent cover, for the one transect, and it could be compared in general, and with caution as there are not enough samples to make a statistical comparison. With that stated, the average canopy cover for trees on this site is 11.8%, which is within the lowest category for tree canopy cover. Warm season grasses, are within the suggested vegetative cover percent, while cool season grasses are somewhat lower than the ecological site suggestions. Shrub cover is higher than suggested, however shrub composition is within the range of variability. Forb cover is within the range suggested in the ecological site description. Overall, it is suggested this site has not deviated from the NRCS ecological site described for this area.

Table 19. Shallow Sandy Loam PJ Site #112, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)			Allotment LHA Ecological Site Means		Allotment Long Term Trend
Shallow Sandy Loam PJ#112 (draft, NRCS)	Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
0-15% Tree Canopy[2] Ground Cover 12%					
Grass	12-58%	1.44-6.9	2.4	→	No significant change (→)
Cool	12-45	1.44-5.4	1.2	↓	No significant change (→)
Warm	0-13	0-1.56	1.2	→	No significant change (→)
Shrub	18-57	2.16-6.8	14.0	↑	No significant change (→)
Forb	0-10	0-1.2	0.2	→	No significant change (→)

Deviation from Ecological site description caution not enough in sample size to give solid comparison.
Deviation from Ecological site: ↑ increase; ↓ decrease; → within range of variability

Trend data comparing the current LHA to the 2002 LHA, indicates across the allotment, perennial forbs, shrubs, and both cool and warm season grasses have remained static. The percent dead browse, and heavily hedged browse increased significantly (5%, p=0.1900) and (18%, p=0.0934) respectively, while the percentage of decadent browse remained static. In addition, exotic vegetation remained static and did not increase (Table 19). When looking at the causal factors, drought, seral stage, current wildlife use, and fire suppression were identified as significant causal factors.

Dirty George # 14023

The Land Health Assessment done in 2012 for this allotment indicates, it is meeting LHS for Standard 3 Vegetation. The largest ecological site in the allotment is deep clay loam with 779 acres, the other ecological site is a mountain pinyon ecological site (NRCS draft, 1995), with 580 acres, these combined acres were evaluated in the allotment.

Current, grazing management was not noted as a concern on the allotment. Current estimates of forage produced on the allotment, with average precipitation, does support the active 133 AUMs. Currently, the carrying capacity on the allotment is 11ac/AUM. This allocation is considered sufficient for this allotment and the higher location on the landscape.

The mountain pinyon #114 site (NRCS, draft 1996) site, should have an optimum basil ground cover that ranges from 15%, when the tree canopy is at its lowest, to a basil ground cover of 8%, when tree canopy is at its highest, > 30%. When tree canopy is lowest, grasses and grasslike species should contribute about 68-130% of species composition and 10.2-19.5 % of the vegetative cover, forbs should comprise about 15-45% of the composition and 2.25-6.75% vegetative cover, while shrubs should contribute about 19-46% composition and 2.85-6.9%

vegetative cover. When tree canopy is the highest, grasses and grasslike species should contribute about 09-48% of the species composition and 0.72-3.84% of the vegetative cover, forbs should comprise about 0-15% composition and 0-1.2% vegetative cover, and shrubs should contribute about 7-31% compositions and 0.56-2.48% vegetative cover (Table 20). The current LHA mean for the site could not be compared to the NRCS ecological site data, as there was not enough transect data in the LHA to create a mean across the LHA area for a comparison. However, there is the percent cover for the **one** transect, and it could be compared, in general, and with caution, as there are not enough samples to make a solid comparison. With that state, the average canopy cover for trees on this site is 19.7%, which is within the middle category for tree canopy cover (15-30%). The current LHA suggests the allotment has not deviated from what is suggested in the mountain pinyon #114 (NRCS, draft 1995) ecological site description, with perennial forbs and shrubs within the natural range of variability. Overall, grass cover and type of grass is within the range of variability (Table 20).

Table 20. Mountain Pinyon Site #114, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)			Allotment LHA Ecological Site Means		Allotment Long Term Trend
Mountain Pinyon #114 (NRCS, draft 1995)	Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
15-30% Tree Canopy[2] Ground Cover 10%					
Grass	26-74	2.6-7.4	15.7	→	No significant change (→)
Cool	24-66	2.4-6.6	15.7	→	No significant change (→)
Warm	2-8	0.2-0.8	0	→	No significant change (→)
Shrub	1-61	0.1-6.1	36.3	↑	No significant change (→)
Forb	0-30	0-3	1.3	→	No significant change (→)

Deviation from Ecological site description caution not enough in sample size to give solid comparison.
Deviation from Ecological site: ↑ increase; ↓ decrease; → within range of variability

Trend data, comparing the current LHA to the 2002 LHA, indicates cover of perennial forbs, grasses, and shrubs have not change significantly. The percent composition of dead browse saw a significant increase of 5% (p=0.1900), while the percent composition of heavily hedged browse saw a significant increase of 18% (p=0.0934). In addition, exotic vegetation did not see a significant increase across the allotment (Table 20). When looking at causal factors, exotic plants, historic livestock management (in relation of proximity to homesteads), and wildlife use current/ historic were noted as causal factors.

Petrie Mesa # 14022

The Land Health Assessment done in 2012, for this allotment indicates it is not meeting (27%) and meeting with problems (71%), for approximately 98% of the allotment. Of this current livestock management was found to be one of the significant causal factors on 27% of the allotment. The largest land mass on the allotment does not have an official ecological site attributed by NRCS, adobe badlands, 2006 acres. The other ecological site is stony salt desert, with 767 acres, these combined acres are what were evaluated in the allotment.

The current LHA suggests, the adobe badland site has not deviated from the natural range of variability, for this soil type (Table 21). Potential concerns noted for this soil type include bare soil, low plant basal area, low perennial grass and forb cover, and low shrub cover. Current causes include drought, erosion from uplands (adobe hills), and OHV use through transect area.

The stony salt desert ecological site should have an optimum ground cover of about 30 %, with perennial grasses contributing about 60% of the species composition and 18% of the vegetative cover, as shrubs should contribute about 30% species composition and 9% vegetative cover, and forbs comprising about 10% of the species composition and 3 % vegetative cover. The current

LHA suggests the allotment has deviated from what is suggested in the stony salt desert ecological site description, with forbs, shrubs, and cool season grasses considerably lower than the ecological site suggestions (Table 22). The warm season grass, mainly galleta, is the most dominant grass and is within the natural range of variability.

Table 21 Adobe Badlands Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Adobe Badland unattributed (closely resembles Clayey Salt Desert)		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
Grass		N/A	N/A	9.1	N/A	
	Cool					No significant change (→)
	Warm					No significant change (→)
Shrub		N/A	N/A	8.9	N/A	No significant change (→)
Forb		N/A	N/A	0.7	N/A	No significant change (→)

Adobe Badland Ecological Site will be compared to site means across the landscape for this soil type and aspect.
Trend data is derived from long term trend transects within the allotment ↑increase, ↓ decrease, →static.

Trend data comparing the current LHA (2012) to the 2002 LHA indicate, across the ecological site, perennial forbs, grasses, and shrubs have not change significantly (Table 21). Concerns noted include, sites dominated by exotic plants, low cool and warm season grass cover, low perennial forb cover, heavy shrub hedging, low shrub vigor, and low cryptogam cover. When looking at causal factors, drought, historic and current livestock management, along with wildlife use historic and current, were noted as significant factors contributing to the not meeting rating for the stony salt desert ecological site.

Table 22 Stony Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means from 2002/2012		Allotment Long Term Trend
Stony Salt Desert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological Site Description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	7.6%	↓	
	Cool	30%	9%	0.0%	↓	No significant change (→)
	Warm	30%	9%	7.6%	→	No significant change (→)
Shrub		30%	9%	0.6%	↓	No significant change (→)
Forb		10%	3%	0.0%	↓	No significant change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment (↑) increase, (↓) decrease, (→) static.

Trend data comparing the current LHA (2012) to the 2002 LHA, indicate across the ecological site, perennial forbs, grasses, and shrubs have not change significantly (Table 22). Concerns noted include, high level of bare soil, exotic plants, low cool and warm season grass cover, low forb cover, low shrub vigor, seral stage issues, historic and current livestock management, and historic and current wildlife use.

Overall, trend data on the allotment across both ecological sites, has not changed from 2002 - 2012 LHA. The adobe badland site within the allotment, is meeting with problems for Standard 3 Vegetation, while the stony salt desert is not meeting Standard 3 Vegetation (Table 21 and Table 22).

Point Creek #14021

The Land Health Assessment done in 2012, for this allotment indicates, it is not meeting for approximately 63% of the public land within the allotment, with livestock management noted as one of the significant causal factors. Concerns recorded, were an overall increase in exotics, decrease in shrubs, and an overall decrease in natives, in relation to the ecological site descriptions and the last LHA completed. The largest ecological site on the allotment, is the stony salt desert with 994 acres. The second largest site adobe badland, 610 acres, does not have an official ecological site designated. Other ecological sites on the allotment include: clayey salt desert, salt flats, and sandy salt desert.

The stony salt desert ecological site should have an optimum ground cover of about 30 %, with perennial grasses contributing about 60% of the species composition and 18% of the vegetative cover, as shrubs should contribute about 30% species composition and 9% vegetative cover, with

forbs comprising about 10% of the species composition and 3 % vegetative cover. The current LHA suggests the allotment has deviated from what is suggested in the stoney salt desert ecological site description with, cool season grasses and forbs considerably lower than suggested, warm season grasses notably higher, and shrubs within the range of variability (Table 23).

Table 23 Stony Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means from 2002/2012		Allotment Long Term Trend (Cover)
Stony Salt Desert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	20.2%	→	
	Cool	30%	9%	0.0%	↓	No Significant Change (→)
	Warm	30%	9%	20.2%	↑	Significant (↑)
Shrub		30%	9%	7.1%	→	No Significant Change (→)
Forb		10%	3%	0.1%	↓	No Significant Change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment (↑) increase, (↓) decrease, (→) static.

There is not a trend comparison for the adobe badland site type for this allotment. However, since it is directly adjacent to the stony salt desert ecological sites on the allotment with similar disturbances and grazing management, trend across the allotment was ascertained from the stony salt desert ecological sites. With that stated, trend on the allotment is considered downward, due to the significant increase in warm season grasses (16%, p=0.1478), at the expense of cool season grasses (0%), which is a considerable deviation from the ecological site description. In addition, there was a significant increase in the composition of heavily hedged shrubs (37%, p=0.0443), and dead shrubs (10%, p=0.1007), Table 23.

South Branch #14004

The Land Health Assessment done in 2012 for this allotment indicates, it is meeting land health standards for the entire allotment. The largest ecological site on the allotment is mountain pinyon (draft NRCS1995), 403 acres, while the second largest site is Deep Clay Loam with 374 acres.

Table 24 Mountain Pinyon #114 Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)			Allotment LHA Ecological Site Means		Allotment Long Term Cover Trend
Mountain Pinyon #114 (NRCS, draft 1995)	Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
30%+ Tree Canopy[2] Ground Cover 10%					
Grass	9-48	0.72-3.84	1.3	→	No significant change (→)
Cool	8-42	0.64-3.36	1.3	→	No significant change (→)
Warm	1-6	0.08-0.48	0	→	No significant change (→)
Shrub	7-31	0.56-2.48	22	↑	No significant change (→)
Forb	0-15	0-1.2	n/a	→	No significant change (→)

Deviation from Ecological site description caution not enough in sample size to give solid comparison.
Deviation from Ecological site: ↑ increase; ↓ decrease; → within range of variability

The current LHA mean for the site could not be compared to the NRCS ecological site data, as there was not enough transect data in the LHA to create a mean across the LHA area for a comparison. However, there is the percent cover for the **one** transect, and it could be compared, in general, and with caution, as there are not enough samples to make a solid comparison. With this stated the current LHA suggests the allotment has not deviated from what is suggested in the mountain pinyon ecological site description.

Trend on the allotment has remained stable from the previous 2002 LHA to the current 2012 LHA, with no significant changes in cover across the varying attributes measured, i.e. perennial grasses and forbs, shrubs, or trees. There were some significant changes in composition, with an increase in percent dead browse (5%), and heavily hedged browse (18%). These changes were attributed to current and historic wildlife use, mainly elk, Table 24.

Ward Creek/Dough Spoon # 14025

The Land Health Assessment done in 2012, for this allotment, indicates it is meeting land heath standards in 21% of the allotment, and meeting with problems for 79% of the allotment. The current LHA suggests the allotment has deviated from what is suggested in the clayey salt desert ecological site description, with cool and warm season grasses and forbs and shrubs lower than suggested. Concerns sited, were a low occurrence of cool and warm season grass cover, low litter cover, exotic plants, mainly halogeton, and low plant diversity in relation to the Ecological Site Descriptions, and the last LHA (2002) completed, Table 25. Causal factors included: drought erosion, historic grazing, noxious weeds, contour furrows, Rights of Way, OHV use (open area), and new BLM roads. Current livestock management was not identified as causal factor within the ecological site.

The clayey salt desert ecological site should have an optimum ground cover of about 15-20%, with perennial grasses contributing about 50% of the species composition and 10% of the vegetative cover, shrubs should contribute about 90% species composition and 18% vegetative cover, with forbs comprising about 10% of the species composition and 2 % vegetative cover, Table 25.

Long term cover trend, on this portion of the allotment, suggests no significant changes in forbs, warm season grasses, or shrubs across LHA years 2002-2012. However, cool season grasses have seen a significant decrease in cover (1%, p=0.1816). There were also no significant changes in cover for exotics, percent dead, decadent browse or low vigor browse. Bare ground showed a significant decrease in cover (4.9%, p=0.0481), while basal and cryptogams significantly increased in cover by 2% (p=0.0692) and 7% (p=0.0692), respectively. Overall, this portion of the allotment is considered in a downward trend for Standard 3 Vegetation, due to the absence of cool and warm season grasses and forbs, Table 25.

Table 25 Clayey Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)			Allotment LHA Ecological Site Means		Allotment Long Term Cover Trend
Clayey Saltdesert	Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological description	Trend Change from 2002 to 2012 LHA
Ground Cover rarely exceeds 20%					
Grass	50	10	0	↓	
Cool	30	6	0	↓	Significant decline (↓)
Warm	20	4	0	↓	No significant change (→)
Shrub	90	18	9.0	↓	No significant change (→)
Forb	10	2	0	↓	No significant change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (20%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment (↑) increase, (↓) decrease, (→) static.

The shallow and sandy loam pinyon juniper #112 site (NRCS, draft 1996) should have an optimum basil ground cover that ranges from 12%, when the tree canopy is at its lowest 0-15%, to a basil ground cover of 8%, when tree canopy is at its highest, > 35%. When tree canopy is lowest, grasses and grass-like species should contribute about 12-58% of species composition and 1.4-6.9 % of the vegetative cover, as forbs should comprise about 0-10% of the composition and 0-1.2% vegetative cover, and shrubs should contribute about 18-57% composition and 2.16-6.84% vegetative cover. When tree canopy is the highest, grasses and grass-like species should contribute about 0-9% of the species composition and 0-0.76% of the vegetative cover, forbs should comprise about 0-10% composition and 0-0.8% vegetative cover, and shrubs should contribute about 0-1% compositions and 0-0.08% vegetative cover, Table 26. Shrubs and forbs show higher numbers than the ecological site suggests, however percent cover of these species

vary widely across this site type. Cool and warm season grasses are within the suggested cover classes suggested by the ecological site description. The current LHA indicates it is within the range of variability for this ecological site type.

Table 26 Shallow Sandy Loam PJ #112 Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means		Allotment Long Term Trend
Shallow Sandy Loam PJ#112 (draft, NRCS)		Species Comp. % by weight	Vegetative Cover %	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
0-15% Tree Canopy[2] Ground Cover 12%						
Grass		12-58%	1.44-6.9			
	Cool	12-45	1.44-5.4	1.7	→	No Significant Change(→)
	Warm	0-13	0-1.56	1.1	→	No Significant Change(→)
Shrub		18-57	2.16-6.8	21.1	↑	No Significant Change(→)
Forb		0-10	0-1.2	3.8	↑	Significant Increase(↑)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (15%) * Species Comp. %
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment (↑) increase, (↓) decrease, (→) static.

Long term cover trend on this site has remained static across LHA years 2002-2012. There have been no significant changes in the amount of forb, shrub, or cool/warm season grass cover, Table 26. Concerns on the allotment include: a small amount of noxious weeds, mainly whitetop, low perennial shrub vigor, and heavy hedging. Factors tied to concerns include drought, roads (BLM), wildlife use current and historic, recreation impacts, lots of hunter camps, and ROW(not roads).

Wells Gulch #14016

The Land Health Assessment done in 2012 for this allotment indicates, it is meeting land heath standards in 29% of the allotment, and meeting with problems for 71% of the allotment. There were no acres within the allotment not meeting standards. Of the 71% meeting with problems, current livestock management was only one of the causal factors, and not found to be the significant causal factor for any one area meeting with problems. Concerns noted, were low occurrences of perennial shrubs, fire, rights of ways, and low cool season perennial grasses and forbs in some areas, when compared to the ecological site descriptions and the last LHA (2002) completed. In addition, an increase in noxious and invasive weeds, mainly halogeton, were noted as having increased on the allotment, and were contributing greatly to areas meeting with problems.

The largest ecological site in the allotment is stony salt desert, with 7,038 acres. The other ecological sites include mountain pinyon, with 506 ac, loamy salt desert, with 109 ac, clayey salt desert, with 2,329 ac, and sandy salt desert, with 381 ac.

The stony salt desert ecological site should have an optimum ground cover of about 30 %, with perennial grasses contributing about 60% of the species composition and 18% of the vegetative cover, shrubs should contribute about 30% species composition and 9% vegetative cover, with forbs comprising about 10% of the species composition and 3 % vegetative cover, Table 27. The current LHA suggests, the allotment has deviated from what is suggested in the stoney salt desert ecological site description, with cool season grasses considerably lower than the ecological site suggestion, shrubs are within the natural range of variability, and warm season grasses are higher than the suggested percent cover. In addition, forbs are showing a decrease in cover from what is suggested in the ecological site description. However, forbs especially annual and early perennials can be highly variable across this ecological site type, and precipitation and timing in reading transects play a major role in whether forbs are depicted accurately.

Table 27 Stony Salt Desert Site, Site Mean, and Long Term Trend Lower Section

Ecological Site Description (Characteristics)				Allotment LHA Ecological Site Means from 2002/2012		Allotment Long Term Trend
Stony Salt Desert		Species Comp. % by weight	Vegetative Cover %[1]	Vegetative Cover %	Allotment Deviation from Ecological site description	Trend Change from 2002 to 2012 LHA
Grass		60%	18%	19.6%	→	
	Cool	30%	9%	0.5%	↓	No Significant Change (→)
	Warm	30%	9%	19.1%	↑	No Significant Change (→)
Shrub		30%	9%	8.5%	→	No Significant Change (→)
Forb		10%	3%	0.8%	↓	No Significant Change (→)

Ecological Site [1]Vegetative Cover % = Optimal Ground Cover (30%) * Species Comp.%
Deviation: ↑ increase; ↓ decrease; → within range of variability
Trend data is derived from statistical test on long term trend transects within the allotment ↑increase, ↓ decrease, →static.

Long term trend data comparing the current LHA 2012 to the 2002 LHA indicates, across the allotment vegetative species cover has not changed. Basal cover significantly increased 4.3%, (p=0.1725), and canopy cover increased significantly, by 18.6% (p=0.0444). Heavily hedged shrubs significantly decreased in composition across the landscape by 31%, (p=0.1898). Overall, this allotment is static for trend across years 2002-2012, Table 27. Concerns noted, were exotic vegetation, low perennial grass cover, and low shrub vigor on 2 sites. Factors tied to concerns include: drought, historic grazing, invasive weeds, ROW, fire and on one site out of 4 current livestock management was identified.

Environmental Consequences:

One of the most significant human caused changes affecting the ecosystems of the Colorado Plateau and surrounding areas was the widespread introduction of domestic livestock. Livestock were brought into the area by the Spanish in the 1500s however cattle and sheep only began to have a significant impact on the region's ecosystems when the railroads made it possible to transport large numbers of livestock into the area. By 1890, hundreds of thousands of cattle and large numbers of sheep were grazing on the Colorado Plateau and surrounding areas. By the time federal forest reserves were proclaimed in the 1890s, ranchers on the Colorado Plateau and surrounding area, had become accustomed to unregulated and unrestricted use of public lands as range for livestock. As a result of this unrestricted use, once rich grasslands were seriously degraded even before the turn of the century. Will C. Barnes (Forest Service's Chief of Grazing) in 1926 put it this way, "this is a clear case of first come first served and the devil take the hindmost."

The unrestricted grazing set the path for rangelands to move from a stable community with varying stable states across thresholds toward other often degraded vegetative states. Thresholds are transitions between multi-stable states where states, are recognizable and relatively stable associations of species occupying an ecological site[14] . Friedel[15]**Error! Bookmark not defined.** pointed out, once a threshold is crossed to a more degraded state, improvement cannot be attained on a practical time scale without greater intervention or management effort than simple grazing control or removal of livestock. In addition, Kitchen and Hall (1995) noted, on **spring** grazed pastures, it would take at least 120 years after the elimination of grazing for fully restore species and the process could take longer, due to the loss of seed sources and increased dominance of introduced exotic annuals. They also state dormant season grazing with sheep at moderate levels appears to pose little threat to the stability of these communities and spring grazing risks could be minimized with a conservative deferred grazing system.

Historically, these rangelands in the North Delta LHA unit, have crossed a threshold from the original vegetation communities (ecological sites), where salt-desert shrub ranges were estimated to have a carrying capacity of 5 acres/AUM, and have transitioned to at least 18 acres/AUM[13]. The ecological sites in the North Delta LHA unit have transitioned across thresholds and have moved towards new degraded stable states with altered vegetation characteristics, as compared to associated ecological sites. With the semiarid climate, relatively fragile vegetation, soils that are slow to recover from disturbance, combined with historical heavy use and some current mismanagement, land health has been impacted which has affected the stability of ecological sites, modified vegetative composition, and has hampered BLM's ability in the past to bring about change in these fragile environments. Laycock[14] suggests that if a vegetation type is in a stable lower stable state (successional), it will not respond to simple changes in grazing management or even the removal of grazing. He further states managers must recognize this situation when it occurs, so that false expectations of improvement are not fostered.

Alkali Flats - The entire Alkali Flats allotment, either meets with problems or does not meet land health standards. With this acknowledged, and the majority of the allotment struggling to meet land health standards, the proposed action adjusts carrying capacity from 9 acres an AUM to 18 acres an AUM which will change the active AUM preference on the permit from 1,001 to

493. Additionally, the proposed action reduces seasonal utilization from 50% to 35%, sets up a path for development of grazing strategies with period rest, and adjusts grazing dates to occur during dormant seasons. With these adjustments in grazing management, it is anticipated the allotment will make small incremental steps toward changing trend, and over time, 25-100 years land health status.

Deer Basin-Midway – This allotment, most notably the lower elevation portion would be considered in poor condition when compared to the ecological sites within the allotment, and the current LHA finding, 99% of the allotment, not meeting or meeting with problems with a downward trend. Currently, the carrying capacity on the allotment is 14acre an AUM. The current estimate of forage produced on the allotment with average precipitation does not support the active 900 AUMs. With this acknowledged, and livestock management contributing to more than a third (40%) of the allotment struggling to meet land health standards, the carrying capacity will go from 14acres an AUM to 47 acres an AUM, which will change the active AUM preference from 990 to 249. In addition, seasonal utilization levels will be adjusted from 50% to 35%.

Delta Pipeline -- The Land Health Assessment done in 2012 for this allotment indicates, it is not meeting land health standards (47%), and meeting land health standards with problems (51%), for approximately 98% of the allotment. Of this, current livestock management was found to be one of the significant causal factors on 47% of the allotment (N. Delta LHA, BLM 2013). Concerns identified, were an increase in exotics, a decrease in shrub cover, low community diversity, and a decrease in perennial forbs, in relation to the Ecological Site Descriptions, and the last LHA completed. With this acknowledged, and livestock management contributing to almost half (47%) of the allotment struggling to meet land health standards the carrying capacity will go from 11 acres an AUM to 24 acres an AUM, which will change the active AUM preference from 563 to 252. In addition, seasonal utilization levels will be adjusted from 50% to 35%.

Dirty George – The Land Health Assessment done in 2012 for this allotment indicates, it is meeting LHS for Standard 3 Vegetation. The proposed action does not change the Active AUMs or utilization levels. There are no anticipated reductions in direct or indirect impacts, compared to the no action alternative, to resolve the exotic plants, and bare soils found as problems in this allotment. The identified causal factors were from wildlife use and historic grazing.

Petrie Mesa- The Land Health Assessment done in 2012 for this allotment indicates, it is not meeting land health standards (27%), and meeting with problems (71%), for approximately 98% of the allotment. Of this, current livestock management was found to be one of the significant causal factors on 27% of the allotment. With this acknowledged and actual use across a 10 yr period at 73 AUMs, management on the allotment will be adjusted to move the allotment towards meeting LHS. Active AUMs will go from 104 to 51, and seasonal utilization will be adjusted from 50% to 35%.

Point Creek- The Land Health Assessment done in 2012 for this allotment indicates, it is not meeting for approximately 63% of the public land within the allotment, with livestock management noted as one of the significant causal factors. Concerns recorded, were an overall

increase in exotics, decrease in shrubs, and an overall decrease in natives, in relation to the Ecological Site Descriptions, and the last LHA completed. With this acknowledged, and 62% of the allotment not meeting Standard 3 Vegetation, and the allotment displaying a downward trend, with livestock management contributing, management on the allotment will need to be adjusted to move the allotment towards meeting LHS. Changes in management will include, reducing the AUM allocation, on the allotment to 68 AUMs, which will allow for 24 acres/AUM, and modifying utilization on the allotment from 50% to 35%.

South Branch- This allotment meets land health standards on 52% of the allotment and meets with problems on 45% of the allotment. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative. Livestock management was not noted as a causal factor for issues on the allotment. Issues noted were from current and historic wildlife use, BLM roads, and use of a historic stock driveway.

Ward Creek-Doughspoon- Overall, current grazing management was not considered a significant causal factor in the health of the allotment for Standard 3 Vegetation, and Standard 4 T&E species. Current estimates of forage produced on the allotment, with average precipitation, should support the active 445 AUMs. Carrying capacity on the allotment is 63acres/AUM. This AUM allocation is sufficient for the location on the landscape, elevation, and vegetation communities on the allotment. Causal factors for areas include, an open OHV area, rights-of-ways, old contour furrow treatments, and historic grazing. The proposed action is unlikely to impact the existing problems.

Wells Gulch- The Land Health Assessment done in 2012 for this allotment indicates, it is meeting land heath standards in 29% of the allotment, and meeting with problems for 71% of the allotment. There were no acres within the allotment not meeting standards. Of the 71% meeting with problems, current livestock management was only one of the causal factors, and not found to be the significant causal factor for any one area. Concerns noted, were low occurrences of perennial shrubs, fire, rights-of -ways, low perennial cool season grasses, and forbs in some areas, in relation to the Ecological Site Descriptions, and the prior LHA completed. In addition, an increase in noxious and invasive weeds, mainly halogeton, were noted as having increased on the allotment and were contributing greatly to areas meeting with problems.

The 1,433 current active AUMs are higher than suggested in the ecological site descriptions by 261 AUMs. With this acknowledged, and current estimates of forage produced on the allotment, with average precipitation, the allotment will go to 1,172 active AUMs. This equates to a carrying capacity of 9acres/AUM. This carrying capacity would be considered low for salt desert shrub communities however, since the allotment is meeting LHS, has no downward trends, and current livestock management was not a significant factor for the meeting with problems rating, the allotment will not have active AUMs adjusted below the ecological site suggestions. The permittee has been progressively managing, using identified areas, periodic rest, and proper utilization rates (~35%). This has allowed the allotment to maintained land health standards and has not declined in standards, from the last LHA (2002) reading. Utilization will stay at approximately 35%.

Proposed Action Summary of Effects The proposed action would be in accordance with CFR §4180.1 Fundamentals of Rangeland Health by addressing direct and indirect impacts.

The proposed action analyzed carrying capacity, in relation to the ecological site description's lowest production potential on all allotments across the North Delta LH unit. Results identified, where allotments were either meeting with problems (downward trend) or not meeting, with livestock management one of the significant causal factors, allotments were in excess of suggested ecological site suggested carrying capacities. Blaisdell and Holmgren[13] stated, salt-desert shrub communities were historically estimated to have a carrying capacity 5acres/AUM, but due to unregulated historic use have transitioned to at least an 18 acre/AUM carrying capacity. This supports the findings, that most salt-desert shrub communities, within the LH unit have crossed a threshold sometime in the past, and entered into another stable, but degraded state. In addition, actual use AUM's were examined to determine, if the permittee came close to using what was determined in the carrying capacity evaluation. It was found, most permittee's used less than what was suggested by the ecological site descriptions lowest production potential, which suggests carrying capacities were still not in balance with the forage available. This supports LH results, which depict salt desert shrub communities continued degradation from 2002 to 2012. These evaluations and findings prompted additional adjustments to the 10 year actual use AUMs (30%) within the proposed action.

Seasonal utilization levels, in the past permit renewal, allowed for 50% use for many areas within the salt-desert shrub community. However, in many citations the suggested utilization rate is 30- 35% in areas with 8"-12" of precipitation. Holechek, Gomez, Molinar and Galt[16] suggest, 30-35% use is needed for the improvement in rangeland vegetation, which is one of many citations that support the reduction in utilization from 50% to 35% in brittle, low precipitation salt desert shrub communities.

With the adjustment in carrying capacities (AUMs), in the Alkali Flats, Deer Basin/Midway, Delta Pipeline, Petrie Mesa and Point Creek Allotments, allotments are anticipated to see minor incremental improvements, in cover and composition of native species within 25-100 years. Increases in perennial grass and shrub cover are slow to occur, and monitoring of trend data will be necessary to determine, if minor changes are occurring. Trends anticipated over time (10-25 years) include, moving downward trends to static, which should slowly cease any new degradation on the allotments, while incrementally moving them towards meeting land health standards. Acres meeting with problems will tend to respond to changes in management more readily, because the vegetation is still comprised of desirable perennial vegetation which under proper management, and moderate additional input, recovers more quickly than areas lacking any semblance to the native community. Acres not meeting standards, will not recover by simply removing grazing or modifying grazing management. Typically, areas dominated by invasive annuals, where desirable perennial vegetation has been compromised, have reached a point of not being able to respond to management changes without additional inputs such as seeding and/or herbicide treatments.

The suggested adjustments in utilization, on these allotments, is expected to improve vigor on perennial grasses and shrubs already established, which should in turn, allow for incremental increases in seed production, propagation, and seedling establishment over the next 25-100 years. These vegetative improvements however, are dependent upon weather patterns, and other outside disturbances, such as fire and drought etc.

In all these allotments, there are areas where simple adjustments to grazing management may not be enough to move acres, across a degraded threshold, towards meeting land health standards. This is partially due to, the dominance of annual invasive species, increased warm season grasses at the expense of the more desirable cool season grasses, and the continued presence of existing disturbance and uses. In these cases, additional inputs such as, herbicide treatment, and seeding etc. will be necessary to move acres towards meeting land health standards.

Additional changes in grazing management, as supported by Kitchen and Hall[17] included, adjusting grazing dates, to end within the dormant vegetative period, which will continue to move allotments, in small incremental steps towards meeting land health standards. Spring grazing will be considered if a permittee has a strategic grazing system in place, which would allow for periodic spring deferment, on a majority of the allotment**Error! Bookmark not defined.**.

The Wells Gulch allotment was meeting land health standards or meeting with problems. Grazing management was not noted as contributing to lands meeting with problems. There were no areas on the allotment that had downward trends. However, in support of good management, carrying capacities were modified to meet ecological site recommendation, and utilization on the allotment was adjusted to 35%. With these adjustments, it is expected current grazing management will maintain and promote the allotment continuing to meet land health standards with no downward trends.

The South Branch and Dirty George allotments were both meeting land health standards and both were within appropriate carrying capacities. Livestock management was not noted as an issue within either allotment.

The Ward Creek/Dough Spoon allotment is well within the appropriate carrying capacity. Livestock management was not considered a significant causal factor in the health of the allotment.

Alternative 2 (no grazing) –Removal of grazing from the North Delta land health area would reduce direct and indirect impacts from grazing, and slowly move allotments towards meeting land health standards. The problems, such as low cool season grass cover, low plant basal cover, and low shrub cover may slowly improve. Kitchen and Hall**Error! Bookmark not defined.** noted, on pring-grazed pastures, it would take at least 120 years after the elimination of grazing to fully restore certain species, and this process could be further hindered by increased dominance of introduced annuals, and other disturbances. In addition, Kitchen and Hall**Error! Bookmark not defined.** tate, continued winter (dormant season) grazing with sheep, at moderate levels, appears to pose little threat to the stability of shrub communities, within the Desert Experimental Range. They

further state, spring grazing increases the risks, but common sense suggests, the effects of spring grazing could be minimized under a conservative deferred grazing system. Other disturbances from rights-of-ways, OHV, and wildlife would continue to have vegetation impacts.

This alternative would also be in accordance with CFR §4180.1 Fundamentals of Rangeland Health, by reducing direct and indirect impacts, which will start to slowly, and incrementally move allotments towards meeting Public Land Health Standard 3, Vegetation. However, due to the long recovery periods, for the salt desert shrub community it is not anticipated this alternative would see improvements in land health status before the 25-100 year time frame. Additionally, it would not be in accordance with the Taylor Grazing Act of 1934 as amended 1936, 1938, 1939, 1942, 1947, 1948, 1954 and 1976, Federal Land Policy and Management Act of 1976 (FLPMA), or BLM's multiple use mission.

No Action Alternative (current management) – Continuation of grazing under current management, would result in similar impacts as found in the 2012 land health assessment. Allotments with acres meeting land health standards would continue to do so under this action, while allotments with acres meeting with problems, with static trends, would remain stable, and allotments with acres meeting with problems, that have downward trends, would continue to degrade, as acres not meeting standards would remain static and/or increase. This action is not in accordance with CFR §4180.1 Fundamentals of Rangeland Health. Direct and indirect impacts would be expected to continue at similar levels. This alternative would not meet Public Land Health Standard for Standard 3 Vegetation.

Finding on the Public Land Health Standard for plant and animal communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Vegetation):

Current land health conditions rate native plant and animal communities (Standard 3) in the North Delta land health unit as 9,951 (16%) meeting, 37,270 (60%) meeting with problems, and 13,318 (22%) not meeting. Meeting acres and acres meeting with problems are reported as acres meeting land health standards. The proposed action, properly implemented, is expected to stop the current rate of habitat degradation for the salt desert shrub and other habitats in the North Delta LHA unit. In addition, minor incremental improvements in native species cover and composition is anticipated over the next 25-120+ years. Such improvements may be most pronounced in those sites meeting with problems with downward trends. For those lands that are not meeting, such anticipated improvements may be undetectable, and may in fact require active restoration to have measurable improvements in native species cover and composition.

INVASIVE, NON-NATIVE SPECIES (includes a finding on Standard 3)

Affected Environment:

Exotic invasive annuals dominate 40,166 acres, for 65% of the vegetation community, in many of the lower-elevation areas in the North Delta landscape. Halogeton (*Halogeton glomeratus*) is by far the most abundant weed, although cheatgrass (*Bromus tectorum*), annual wheatgrass (*Eremopyrum triticeum*), purple mustard (*Chorispora tenella*), filaree (*Erodium cicutarium*), and European madwort (*Alyssum simplex*) are also common throughout the unit. Noxious weeds are present on 4,786 acres, for 8% of the North Delta landscape. Russian knapweed (*Acroptilon repens*), whitetop (*Cardaria draba*), and tamarisk (*Tamarix* spp.) are often present, in disturbed

drainages, erosion pits, contour furrows, or gullies. The annual weeds are dominant in areas, where the mature perennial vegetation has been compromised. In salt desert shrub areas, where the native perennial vegetation is present, exotics are typically present, but in far less amounts, suggesting a tie between health of the native community, and the ability of the annuals and noxious weeds to take over.

Environmental Consequences:

Impacts Common to all Alternatives- Weeds in rangeland cause an estimated loss of $2 billion annually in the United States, which is more than all other pests combined. They impact the livestock industry, by lowering carrying capacities, quality and quantity of forage, they interfere with grazing management, poison animals, increase cost of management, increase the cost of livestock production, and reduce land value. They also impact, wildlife habitat and forage, deplete soil and water resources, and reduce plant and animal diversity. Noxious and invasive weeds can out compete native plant communities even under good management. Weeds prefer highly disturbed sites, such as pipelines, roads, recreation trials and staging areas, grazing projects for either livestock or wildlife, livestock or wildlife bed grounds, overgrazed areas, and tend to form monocultures in highly disturbed areas. Once weeds are established they can spread by many vectors including, vehicles, wind, livestock, wildlife, recreation, waterways, and the suppression of native species etc. The suppression of native species is achieved through many avenues, from exploiting resources before native seedlings have the opportunity to use them, suppression of native vegetation through allelopathic effects, which is associated with secondary compounds produced by the weed to inhibit seedling establishment, and through compounds like alkaloids, which make them resistant to herbivory due to negative feedbacks (sick feeling) to the grazer.

Proper grazing management is crucial in the control of noxious and invasive weeds. It is essential for maintaining competitive perennial species, seedling establishment of desired species, and proper functioning soil dynamics, which support native plant species and, bind native ecosystems together.

Proposed Action – The proposed action evaluated carrying capacities in relation to the ecological site description, and found most of this rangeland had greatly deviated from the amount and type of vegetation suggested. In addition, the evaluation found most allotments were over suggested carrying capacities, especially for salt desert shrub communities in poor condition. Degraded rangelands have a higher susceptibility to invasion from exotic and noxious weed species than intact native systems, which show resilience to the establishment of weedy species, especially exotic annuals.

The Alkali Flats, Deer Basin Midway, Delta Pipeline, and Point Creek Allotments, all show over 60% of the acreage in each allotment in a downward trend, and not meeting land health standards, with livestock management, and exotic species as a major contributing factor. Petrie Mesa, Dirty George, South Branch, and Wells Gulch, were found to be in static trend, with Dirty George, and South Branch meeting land health standards, while Well Gulch is meeting with problems, not due to current livestock management. Ward Creek Dough Spoon was meeting with problems, and exhibiting 56% downward trends, but livestock management was not noted as contributing to the determination. Exotic invasive species, and noxious weeds were considered

ubiquitous across the land health unit, and one of the major causal factors on most of the allotments. The proposed action suggests, reductions to carrying capacities (AUMs) to reflect available perennial forage on allotments, adjustments to utilization from 50% to 35%, limitations on spring grazing use, and the incorporation of a grazing strategy that incorporates periodic rest.

Adjusting carrying capacities will reduce overgrazing of perennial vegetation by balancing grazing with the amount of available perennial forage on each allotment. Implementing a conservative utilization level of 35%, as support by Holechek, Gomez, Molinar, and Galt[16], will ensure there is adequate plant material left, for the plant to initiate photosynthesis, store carbohydrates, replace root material, and complete reproductive activities. While implementing a grazing strategy, which allows for period rest of pastures and/or use areas within allotments, will support the establishment of seedlings, increase vigor of perennial species, and support a system that will be more resilient to exotic species establishment. It is anticipated, the combined changes to grazing management, will decrease the opportunity for exotic species establishment on additional acres, halting any new downward trends on the allotment(s) due do exotic and noxious weed establishment. In addition, these changes will allow for slow incremental step towards reducing exotic weeds in allotment(s), and increase the potential movement of more acres into static trends, and over time 25-100 years upward trends. Although, grazing management changes are necessary to reduce continued degradation, note on some acres that have crossed a threshold where a new stable, although degraded state has been established, additional inputs such as, herbicide treatment, seeding, and minimizing of new disturbances may be necessary to move allotments from downward trends, to static, and eventually upward trends. In addition, Kitchen and Hall**Error! Bookmark not defined.** suggest, it may not be prudent to attempt restoration of annualized and due to the cost and high probability of failure. They go on to say, such communities may be highly unstable due to the presence of introduced annuals, even if restoration is achieved. In addition, continued disturbances outside managed grazing would still continue exposing the area to the reintroduction of exotic species. Additionally, it is cautioned by Laycock[14] once a vegetation community is in a lower stable successional state it may not respond to changes in grazing and managers must recognize this situation when it occurs so that false expectation of improvement are not fostered.

Alternative 2 *(no grazing)*-Most invasive species were introduced from Eurasia with the settlement of the west, and are highly aggressive, lack their native pathogens and predators, and contain chemical compounds that make them unpalatable compared to native species. During the establishment phase, species like cheat grass, halogeton, and medusahead flourish at the expense of native species, and now dominate millions of acres. The simple removal of grazing from the North Delta LH unit, and the associated 9 allotments, will not reduce or eradicate established noxious and invasive exotic species from the landscape, due to continued points of disturbance, introduction, and establishment of new infestations through new and existing disturbances such as, pipelines, powerlines, roads, recreation trails and staging areas, open OHV areas, and wildlife use etc.

Even though this alternative would reduce one disturbance grazing on the landscape, it does not address indirect and cumulative impacts from other disturbances. These disturbances are expected to continue, and by association the continued establishment of invasive exotic and

noxious species. Therefore, it would not meet Public Land Health Standards for Standard 3 Vegetation.

No Action Alternative –Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Allotments with acres meeting land health standards would continue to do so under this action, while allotments with acres meeting with problems, with static trends, would remain stable or degrade, as allotments with acres meeting with problems, with downward trends, would continue to degrade, while acres not meeting standards would remain static and/or increase. This action is not in accordance with CFR §4180.1 Fundamentals of Rangeland Health. Direct and indirect impacts would be expected to continue at similar levels.

This alternative would not meet Public Land Health Standard for Standard 3 Vegetation. *Finding on the Public Land Health Standard for plant and animal communities (partial, see also Wildlife, Aquatic; Wildlife, Terrestrial; and Vegetation):* The proposed action modified several areas of grazing management that needed to be addressed. With these changes in grazing management, it is predicted livestock grazing should not contribute to additional degradation due to increases in exotic species.

TERRESTRIAL WILDLIFE; including Migratory and Special Status Birds, Special Status Terrestrial Wildlife

Within the planning area, there are several special status species. Species were selected for analysis based on, inventory data maintained by the UFO, Colorado Parks and Wildlife Natural Diversity Information Source (NDIS), and inventory data available from the Colorado Natural Heritage Program (CNHP). The UFO also utilizes, the U.S. Fish and Wildlife Service Information, Planning, and Conservation System (IPaC) to generate the most current species list, and to analyze the effects of a Proposed Action on threatened, endangered, candidate species, and critical habitat for these species.[18] Those species that are not known to occur or have the potential to occur will have no further discussion in this document. More detailed documentation is found in the project record for those species that were removed from further consideration. In accordance, with BLM Manual 6840, the goal of management is to prevent a trend toward federal listing, or loss of viability for sensitive species.

Affected Environment

General Discussion

Issues & Measures for Analysis

Resource Issue Area/Potential Effects:

- How would domestic grazing practices of the proposed action and alternatives affect vegetative cover and habitat suitability for terrestrial wildlife species?

Analysis Area:

- North Delta LHA area

Cumulative Impacts Analysis Area (CIAA):

- N Delta, Escalante and Gunn Gorge LHA areas

Impact Indicators:

- Acres meeting, meeting with problems, not meeting Standard 3.
- Acres meeting, meeting with problems, not meeting Standard 5 (riparian).

The analysis area for impacts to terrestrial wildlife, including migratory birds, and special status terrestrial wildlife, includes, the North Delta LHA area totaling 61,449 acres of BLM administered public lands, where both direct and indirect effects occur. However, some of the indirect and cumulative effects also occur, for the same species analyzed, within the Escalante, and Gunnison Gorge land health units (**Error! Reference source not found.**). In the case of ighorn sheep, a 22-mile buffer around the 3-LHA area (Figure 10), based on potential foray distances. In the case of pronghorn antelope, the two neighboring pronghorn populations are discussed.

Both the North Delta and the 3-LHA areas support a large variety of upland and riparian wildlife species. Some species are year-long residents, while others are migrants. A variety of small mammal, bird, and reptile species are scattered throughout the area, where their specific habitats are present. Habitat variety is great, and is created by diversity in topography, slope, aspect, vegetation, soils, and climate. The description of existing vegetation in the vegetation section provides a more detailed description of most wildlife habitats that occur, and the current state of Land Health. The greater 3-LHA area is predominated by pinyon juniper (36%), and salt desert shrub (34%), with a smaller portion of mountain shrub (13%), and sagebrush (12%), vegetation types. The North Delta area is predominately composed of salt desert shrub (76%), with a small component (14%), of pinyon juniper vegetation types. Included in the general discussion of wildlife species are predators and big game species.

Predators

Large predators, such as coyotes, cougars, and black bears use the area regularly as parts of their larger overall ranges. Of the predators, coyotes are the most numerous and widespread. Black bear primarily use the major drainages with well-developed riparian vegetation, and the higher elevation oak/serviceberry areas, especially during spring, late summer, and fall for feeding. Summer concentrations for black bear are at higher elevations along the Grand Mesa, West Elks and Uncompahgre Plateau for this area. Fall Concentrations overlap with summer concentration areas and extend to lower elevations on the slopes of Grand Mesa and Uncompahgre Plateau. Mountain lion probably use nearly all of the area at some time or another while hunting, or raising young. At present, CPW does not have an accurate estimate of mountain lion populations, and they are generally considered to be in the area. The number of mountain lion present is probably very low, limited mostly to the ones who have established their territories, or parts of their territories in this area.

Historically, large predators were either eliminated (grizzly bear and wolves) or greatly reduced (mountain lions and black bears), which allowed smaller predators such as coyote, fox and bobcat to expand and flourish. Predator control programs were effective, and widely employed in the 1800s to the later 1980s. Limited predator control activities continue in the area by Animal Damage Control (APHIS), at the request of livestock producers, if there are problem animals.

Allotments within this planning area occur, within B-17 for black bear and L-9 for mountain lion. The larger cumulative effects analysis area also, includes B-5 for black bear and L-22 for mountain lion.

Overall, bear mortality has increased over the last 10 years in DAU B-17, and conflicts between bears and humans are not uncommon.[19] The most significant issue regarding bear management, in the Grand Mesa (B-17) area relates to balancing the demands of hunters, livestock producers, local residents, and non-consumptive users of wildlife. The highest mortality years for black bear in DAU B-5 occurred in the late 1990's through the early 2000's, and were probably related to severe drought conditions and catastrophic mast crop failures. This caused bears to be mobile, and in search of non-traditional food sources, making them more susceptible to hunter harvest and control kills. Trends in mortality, as well as age and gender data collected from harvest bears lead CPW to believe the population is increasing[20].

Smaller predators like coyote, red fox, skunk, and raccoon are thought to be increasing, because they adjust very well to human-disturbed environments, and now thrive in close proximity to people.

Deer and Elk

Mule deer and elk are probably the most noted wildlife species that occur due to their historic prominence in the ecosystem, and their high social and economic value to the area and region. Both species use the area year long, but primarily they use it as winter range, coming from higher elevation summer ranges on Grand Mesa, West Elks and Uncompahgre Plateau. The intensity of use by each species varies widely from year to year, and is controlled primarily by population size, and the variation in timing, and amount of snowfall. During most winters there is a high degree of overlap in mule deer and elk use on winter ranges however, the extent of competition is unknown. Winter range is located at lower elevations, primarily in the sagebrush and pinyon-juniper vegetation. CPW classifies various portions of the larger analysis area as mule deer and elk severe winter and winter concentration areas. The severe winter range and winter concentration areas constitute BLM's crucial winter range. Critical winter habitat makes up approximately half of the entire area, with overlapping mule deer and elk habitats composed of 35% of the area as mule deer severe winter, 23% of the area as mule deer winter concentration, 28% of the area as elk severe winter, and 17% of the area as elk winter concentration (Table 28). Comparatively, the North Delta area supports only a small portion of all big game winter critical habitat (16%), with overlapping mule deer and elk habitats composed of 4% mule deer severe winter, 11% mule deer winter concentration, 12% elk severe winter, and 34% elk winter concentration.

Table 28. Big game winter seasonal habitat for the analysis areas.

Habitat	***North Delta (147,797 acres)***	***Escalante (121,062 acres)***	***Gunnison Gorge (320,356 acres)***	***Total (589,215 acres)***
Mule Deer Severe Winter	8,025.1 (4%)	11,286.9 (54%)	86,796.4 (42%)	207,687.5 *(35%)*
Mule Deer Winter Concentration	15,062.9 (11%)	38,089.6 (28%)	80,827.5 (60%)	133,979.9 *(23%)*
Elk Severe Winter	18,935.2 (12%)	66,175.2 (40%)	78,492.7 (48%)	163,603.2 *(28%)*
Elk Winter Concentration	33,498.2 (34%)	20,607.1 (21%)	44,866.3 (45%)	98,971.6 *(17%)*
Total Winter Big Game Habitat	47,915.4 *(16%)*	116,465.4 *(38%)*	143,087.7 *(47%)*	307,468.6 *(52%)*

( )—percent of seasonal habitat within LHA area; *(Italics)*—percent of the total area composed of this seasonal habitat

Federally Listed Species

Of the Federally listed species evaluated in the tables above, only the threatened Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) occurs within the North Delta LHA unit. There are no other Federally Listed terrestrial species known, or are likely to occur, within the North Delta analysis area. There will be no effect to any of the other terrestrial species listed for the UFO, and there will be no further discussion of these species.

There are adverse effects from the proposed action for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), and the species is brought forward for detailed analysis (See Threatened, Endangered, and Sensitive Species Plants section).

BLM Sensitive Species

Of the Terrestrial BLM Sensitive Species evaluated in the tables above, and within the analysis area, terrestrial wildlife species that are known, or are likely to occur within the project area are brought forth for analysis below. There will be no effect to any of the other species listed for the UFO, and there will be no further discussion of these species.

Sensitive Bat Species

Of the BLM sensitive bat species expected to occur in the project area, only foraging habitat is expected. Effects to these species are expected to be immeasurable and discountable, and could generally be included in the description of effects to general wildlife species. There will be no further discussion of these species.

Assumptions:

- Lands meeting land health standards for Standard 3 (Native Plant and Animal Communities) and 2 (Riparian), would be suitable habitat for wildlife species and would provide for viable populations.

Land Health Findings

Land Health Standard 3, determinations have changed since the proceeding Land Health Assessment of 2000-2001 (Figure 4). While there was a slight increase 3%, in areas meeting

standards, and a 10% decline in areas meeting standards with problems, there was also an increase in areas not meeting land health standards 9%. Of concern for the North Delta area, is there remains 82% of the area that is meeting with problems (60%), or not meeting (22%), and more than half of the area is showing a downward trend (54.3%) from 2002 to 2012.

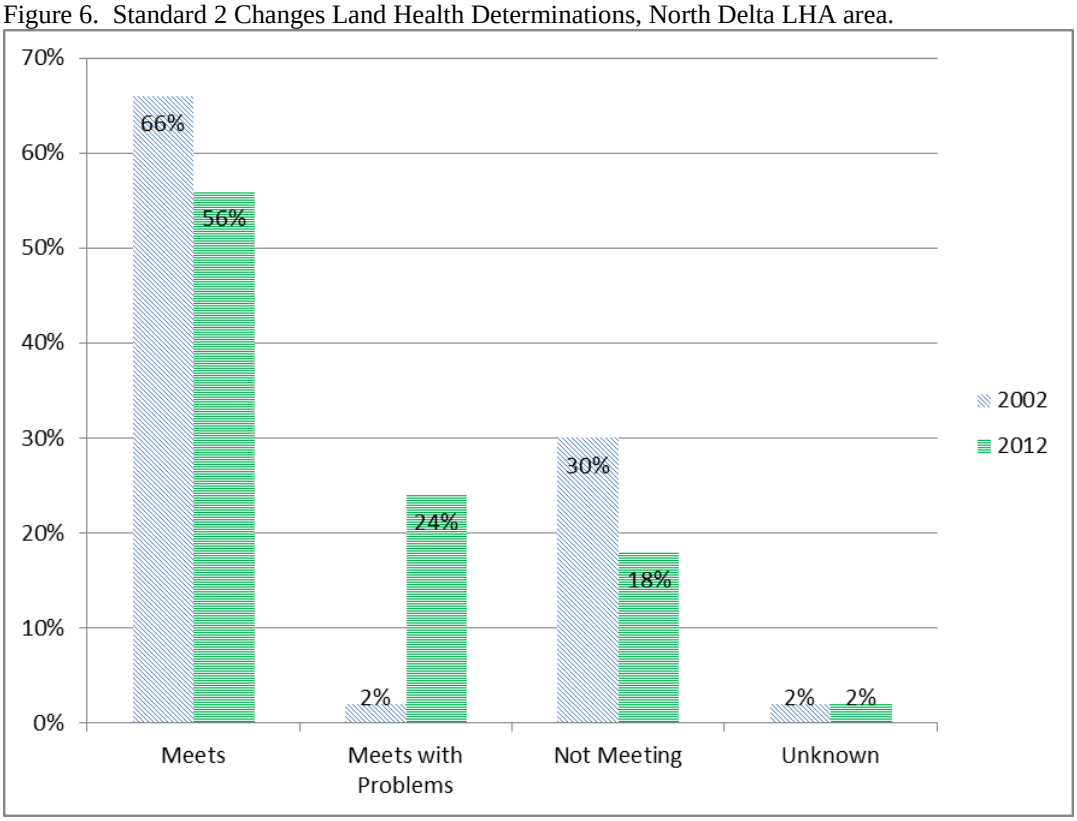
Identified indicator issues and concerns for upland vegetation communities, that resulted in lands not meeting or meeting with problems included, exotic plants competing and/or degrading habitat, low perennial cool season grass cover, low perennial forb cover, low native vegetation diversity, low shrub vigor, low shrub cover, and the presence of noxious and exotic weeds. The LHA identified 73% of the acres assessed having invasive exotic or noxious weed species as a problem. See TES Plants section for additional discussion specific to the salt desert shrub community. Based on the allotment by allotment vegetation analysis general concerns include, much of the area not achieving ecological site suggestions due to, less than expected cover of perennial shrubs, cool season grasses and perennial forbs; higher than expected cover for warm season grasses (in stoney salt desert). Of concern for wildlife habitat, is the general decline in perennial shrubs, increases in dead and heavily hedged shrubs between the 2001 and 2012 assessments.

Causal factors are collected at the upland study sites during the field sampling portion of the LHA, and were identified by comparing evidence of human-related or notable natural influences between sites meeting health standards versus those with land health problems. Some of the causes cited, are historic grazing, current grazing, drought, nearby agriculture and residential occupation. See vegetation section for more details.

Riparian vegetation is also habitat for various wildlife species. Land Health Standard 2 determinations, have also changed for this standard since the proceeding Land Health Assessment (Figure 6). While there is a decrease in areas not meeting, from 30% to 18%, there was a decrease in areas that meet, from 66% to 56%, and a large increase in areas that meet with problems, from 2% to 24%. Trend information is not available for areas meeting with problems, or not meeting for this standard.

Identified indicator issues and concerns, for riparian vegetation communities, that result in lands not meeting standards or meeting standards with problems included, issues related to channel morphology, floodplain infrequently flooded, water and sediment not in balance with channel dynamics, and riparian vegetation issues. Some of the causes cited are historic livestock grazing, channelization, drought, and various causal factors related to regulated water levels and uses. See riparian section for more details.

Figure 6. Standard 2 Changes Land Health Determinations, North Delta LHA area.



Of all the various terrestrial wildlife species, several species need more detailed discussion due to potential issues

American Pronghorn -Issues & Measures for Analysis

Resource Issue Area/Potential Effects:

- How would domestic grazing practices of the proposed action and alternatives affect vegetative cover for pronghorn fawn hiding cover?
- How would domestic grazing practices affect vegetation composition relative to forage nutrition (summer forbs/winter browse) for pronghorn does and fawns?

Analysis Areas and Rationale:

- Allotments that overlap with the CPW overall range for N. Delta pronghorn herd (Alkali Flats, Deer Basin/Midway, Delta Pipeline, Petrie Mesa, Point Creek, Ward Creek/Doughspoon, Wells Gulch);

Cumulative effect:

- CPW overall range for three herds in SW CO (Grand Junction, UFO, Tres Rios)

Impact Indicators:

- Acres meeting, meeting with problems, not meeting for Standard 3.
- Acres meeting ecological site descriptions
- Number of days of grazing permit dates overlapping with fawning (15-May to 1-July[21])
- Number of allotments with overlap with fawning dates;
- Percent of pronghorn herd with BT and/or EHD.

Discussion

Pronghorn use flat or rolling expansive areas, and are adapted to hot deserts, or alpine plateaus. for protection from predators. Newborn fawns are more drab in color than their parents, and spend the greater portion of their first few weeks of life hidden, rising only to nurse.[22] Pronghorn are present on the salt desert shrub, grassland, and grass/forb sites in the analysis area, predominantly in the North Delta area, with some use in the Escalante area (Table 29).

Table 29. Portions of the three LHA areas that contain Pronghorn habitat.

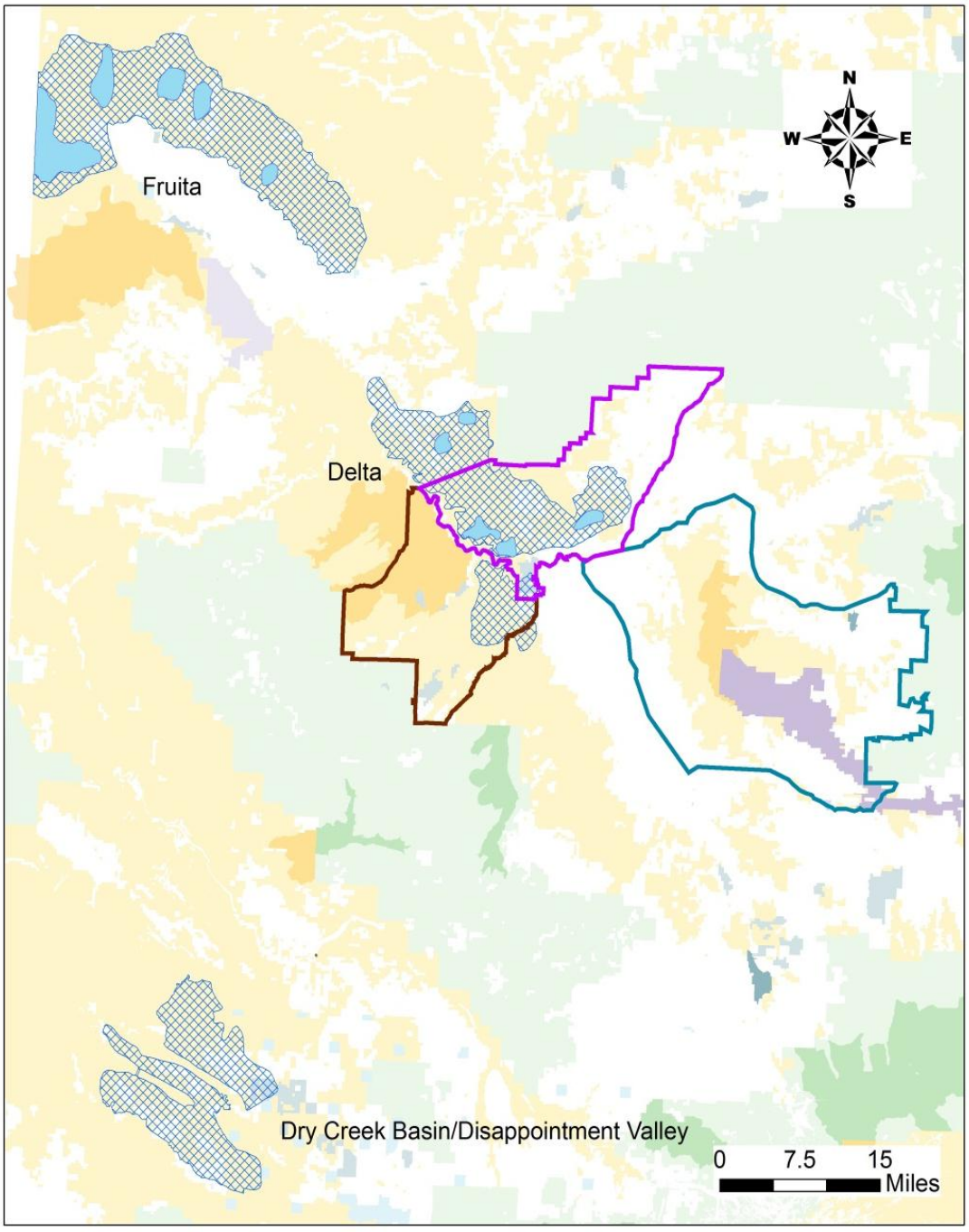
Habitat	*North Delta*	*Escalante*	*Gunnison Gorge*	*Total*
Overall Range	62,671.5 (77%)	18,736.1 (23%)	0	81,407.7
Winter Concentration	5,636.8 (100%)	0	0	5,636.8

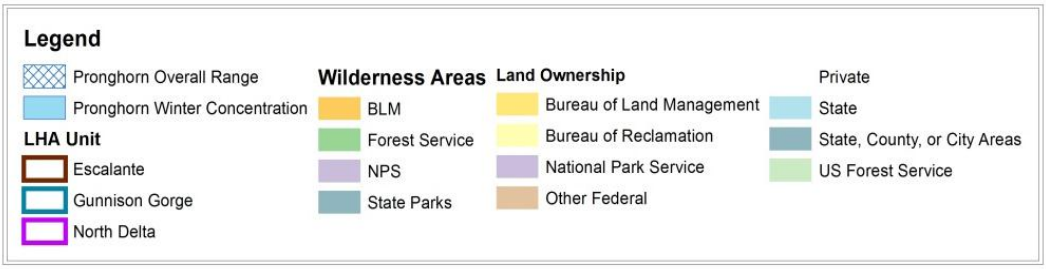
Within western Colorado, there are two other populations: A-22 (near Fruita) and A-99 (Dry Creek Basin/Disappointment Valley) (Figure 7).

The population near Fruita (GMU 30, DAU A-22) fluctuates from year to year, based on moisture and productivity of the adjacent herd in Utah[23]. When the Utah herd is performing well, pronghorn expand into Colorado, but during drought the population does not perform as well in Colorado based on the lack of water. CPW estimates very few pronghorn are currently residing in Colorado for this population, and that water is the limiting factor.

The Dry Creek Basin/Disappointment Valley herd (GMU 70, A-99), has been somewhat steady between 30-50 pronghorn over the last 5 years. This population does not appear to be performing well, primarily following the extreme drought conditions in the early 2000's. The majority of the herd resides in Dry Creek Basin, where there are more reliable natural water sources. The herds in Gypsum Valley and Disappointment Valley have rarely been observed in recent years. This population has received numerous transplants, between the late 1960's and mid 1990's, yet the population has never performed really well, and has never been hunted. CPW estimates that drought conditions are probably limiting this population based on lack of water sources, but probably more importantly available forbs and grasses.

Figure 7 Pronghorn populations in southwestern Colorado, relative to the N. Delta Project Area.





Current pronghorn antelope populations in the project area (Delta, A-27), are estimate at 80-100 animals. Pronghorn had become locally extirpated, and were reintroduced in the 1970s. Forty-four animals were trapped, from Chico Basin in SE Colorado, and released in the Wells Gulch area; 59 animals were trapped from the Maybell area, in NW Colorado, and released in the Roubideau Creek area. Information from CPW biologist[24] describes the reintroduction of this pronghorn population as a classic species reintroduction bell curve, of growing very well for a number of years in the late 70's and early 80's, when CPW estimated over 300 pronghorn in the area, and issued quite a few licenses. However, by the late 80's the population began a slight reduction, and drastically reduced during the drought years of the early 2000's, probably associated with forage quality, and possibly hemorrhagic disease die-offs. A research project was initiated by CPW in 2012, with the capture of 19 local pronghorn[25]. All but one of these animals (95%) tested positive for exposure to Blue tongue (BT) and Epizootic hemorrhagic disease (EHD). Additionally, in March 2012, 24 pronghorn were trapped and relocated from SE Colorado to the Delta-Mesa County line. Seventeen of the 24 transplanted pronghorn (71%) tested positive for exposure to BT/EHD. Radio tracked pronghorn use much of the North Delta project area and beyond (Figure 8).

Cattle are the primary reservoir of BT virus, and probably EHD virus (although infrequent)[26]. BT is primarily a disease of domestic sheep, with mule deer, pronghorn, and bighorn sheep being susceptible. Cattle are reservoirs for BT because they often do not develop symptoms, but are chronic carriers. Soft muddy margins of ponds or slow-moving streams contaminated with cattle feces produce large numbers of no-see-um gnats, which are carriers of BT. Although, losses to hemorrhagic disease can be significant, animal populations generally recover quickly, and there is little wildlife management agencies can do to prevent the occurrence[27].

As of February 2012, CPW reported 2 known mortalities of neck banded does that were hit by cars on Hwy 50, 1 local capture and 1 transplanted. Of the radio-collared animals, 7 of the 10 local captures have died, while only 1 of 9 radio-collared pronghorn transplanted from the southeast have died[28]. Causes of death, of radio collared pronghorn, were reported as coyotes (4), fence (1), and unknown (3). In July 2012, a coordinated ground survey was conducted to classify pronghorn in this population. A total of 52 pronghorn were classified with an observed fawn:doe ratio of 4.8 fawns/100 does, and 19.1 bucks/100 does. Both of these ratios are very low compared to other pronghorn populations. Low fawn production could be due to malnutrition and/or lack of hiding cover. Malnutrition that extends into late gestation causes birth of small weak young with reduced chances of survival. Pregnant females protect developing fetuses by catabolizing much of their own fat and protein, and if severe enough will eventually abort or resorb fetuses due to malnutrition[29]. Additionally, it is suggested plant communities averaging ≥15” in height appear necessary to decrease fawn mortality by predators.[30]

After several years of decline, the Delta pronghorn population may have stabilized, with indication of a possible slight increase the last 2 years based on improved fawn:doe ratios, and the limited mortality seen from the remaining collared pronghorn[24].

As far as CPW priority for these populations, all three western pronghorn populations are probably lower priority, based on quality of habitat, population potential, and lack of hunting

opportunity[23]. For the most part, these populations are probably now being managed for watchable wildlife opportunities, at least until habitat condition improves for these landscapes providing for larger herds, with hunting opportunities.

CPW mapped overall range for pronghorn overlap, with most of the allotments, in the North Delta area and include, Alkali Flats, Deer Basin/Midway, Delta Pipeline, Petrie Mesa, Point Creek, Ward Creek/Dough Spoon, and Wells Gulch (Table 36 and Table 39). Two allotments within pronghorn habitat overlap with fawning season:

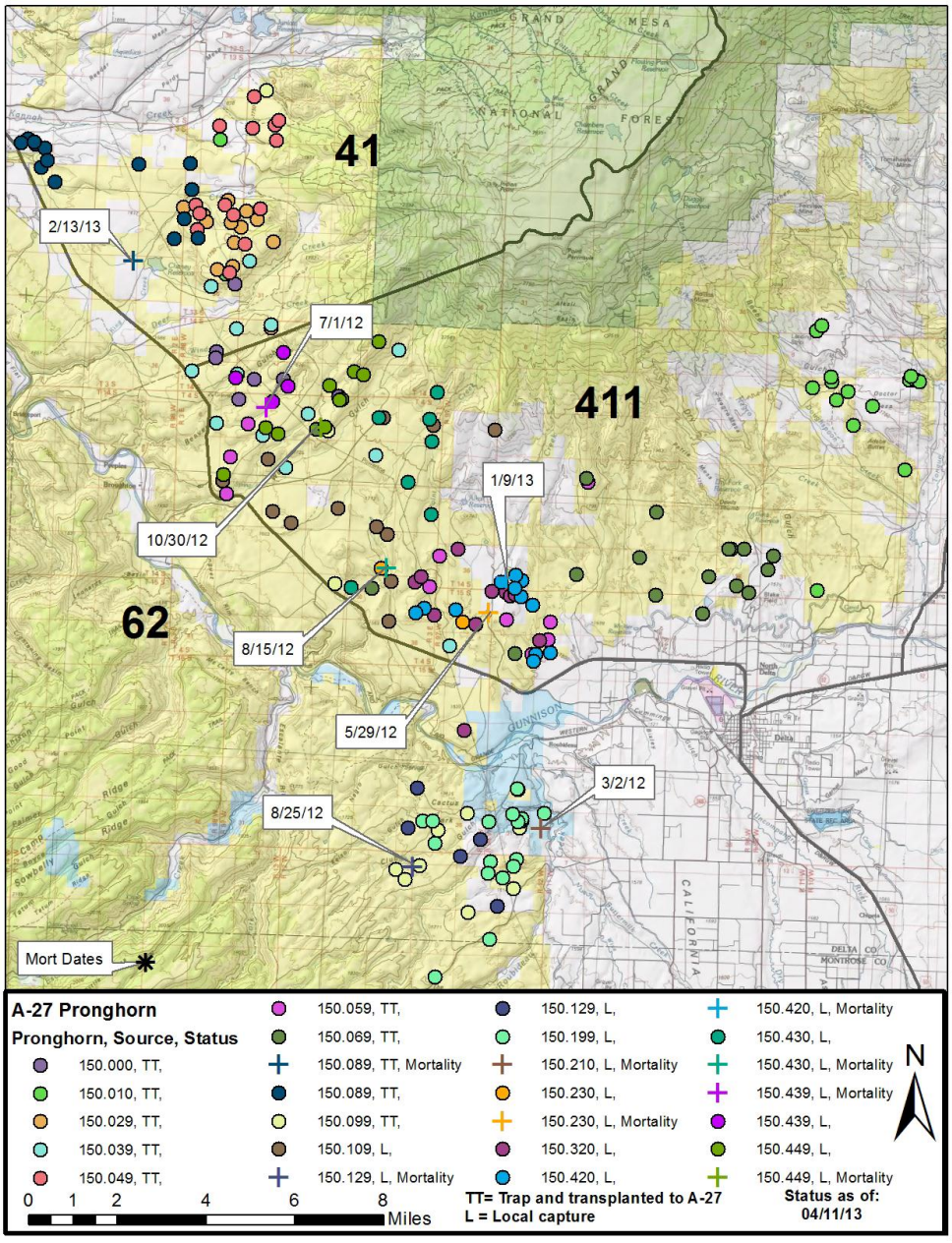
- **Point Creek**—LHA indicates, it is not meeting for approx. 63% of the public land within the allotment with livestock management noted as one of the significant causal factors.
- **Ward Creek/Dough Spoon**—Overall, current grazing management was not considered a significant causal factor in the health of the allotment for Standard 3 (vegetation).

There are several factors that promote healthy pronghorn herds including, adequate water during the summer, desirable shrubs in the winter, and forbs in the spring and summer. Water availability is recognized by both CPW and BLM as limiting for this population. With large tracts in the project area, meeting with problems, downward trends, or not meeting Standard 3 Healthy Vegetative Communities, the rangeland may not be providing adequate, shrubs, forbs, and hiding cover, for the sustainability of pronghorn herds.

Assumptions:

- Pronghorn condition, fawn survival, and population growth were limited by winter severity, and intraspecific competition for summer forbs, and winter browse[31].
- Fawn production and survival is dependent on Doe nutrition (summer forbs/winter shrubs [browse]), vegetative cover (cool season grass cover), and fawn nutrition (forbs).
- Competition and dietary overlap between domestic sheep, and pronghorn for forage (forbs and shrubs)[32].
- Areas meeting ecological site descriptions would provide adequate habitat to produce fawns and have them survive to adulthood. This includes adequate forage and hiding cover.

Figure 8. Pronghorn locations of locally captured and transplanted individuals since capture and release (from CPW 2013).



Badlands/Salt Desert Ecological Site Species (White-tailed Prairie Dog, Kit Fox and Burrowing Owl [BLM Sensitive])

Issues & Measures for Analysis

Resource Issue Area/Potential Effects:

- How would domestic grazing practices, of the proposed action and alternatives, affect vegetative cover, and habitat suitability for kit fox, white-tailed prairie dog and burrowing owl (salt desert shrub habitat species)?

Analysis Areas:

- Salt desert ecosystem in N. Delta area
- These three species are depend on the salt desert ecosystem for a majority of important life functions; kit fox and burrowing owl are associated with prairie dog towns.

CIAA Analysis Area:

- N. Delta/Escalante/Gunn Gorge LHA areas for Cumulative Effects.

Impact Indicators:

- Acres (%) of salt desert shrub meeting standards, meeting standards with problems, and/or not meeting standards, for Standard 3.

Discussion

White-tailed prairie dog, kit fox, and burrowing owl are all BLM sensitive species, and for the North Delta area are closely tied with the badlands/salt desert vegetation community (See TES Plants section for more discussion on this vegetation type). Kit fox are considered endangered by CPW. They were known to be in the North Delta and Gunnison Gorge area in the early 1990s.[33] Recent studies by CPW in the Grand Valley area (Montrose to Grand Junction), resulted in only one probably kit fox detection[34]. CPW concluded that kit fox populations in Colorado are close to extirpation. They attributed this to, 1) interspecific competition with other predators (i.e. red fox, coyote, domestic dog, and domestic cat); 2) prey availability; 3) environmental conditions (drought); and 4) increased human disturbance, such as OHV use. The number of domestic predators that were detected during surveys, and their potential adverse impacts on kit fox, were stated as a valid concern. They also stated that human-facilitated changes in the western landscape during the last century have caused alterations in plant species composition, and disruption of ecosystem function and structure. These rangeland condition changes may have resulted in kit fox populations being more susceptible to environmental conditions. OHV use in Peach Valley (Gunnison Gorge LHA area) is extensive, with roads, and motorcycle trails bisecting the entire study area. One of the strongholds for kit fox in the 1990s was the Peach Valley area. Kit fox can tolerate some level of human disturbance but Link[35] noted that kit foxes in Colorado, spent more time in their dens during weekends when peak periods of noise and disturbance occurred. The human population in both Delta and Montrose counties is increasing, resulting in more people recreating in the area. This increase in recreational activities may disturb kit foxes, and cause additional stress to already small populations, making it difficult for maintenance and re-colonization to occur.

White-tailed prairie dogs are known to be in the North Delta area, and may occur anywhere there is open grass/salt desert shrub vegetation. Prairie dogs prefer forbs, and the proportion of grasses and forbs in their diet changes seasonally. Prairie dogs, depend on burrows to, (1) protect them from inclement weather and predators; (2) provide refuge for bearing and rearing young; and (3) as hibernacula. Lack of precipitation, extreme daily temperatures, and/or lack of forage and water appear to be the ultimate factors driving aestivation and hibernation. They can hibernate from up to 5 months during the winter, and will aestivate during mid- to late summer.

BLM mapped some of the prairie dog colonies in the 1980s, but there has been very little follow-up mapping. The last survey was completed in 2007, during which 59 known prairie dog colonies northwest of Montrose were visited, and compared with distribution data collected from the mid-1990s[36]. Approximately, 17% of the colonies showed signs of current prairie dog activity, while the remaining colonies were abandoned or extirpated. The active sites were all

located north of the Gunnison River in Delta County. Plague-caused fluctuations in prairie dog populations and has resulted in some of the previously mapped sites being abandoned. Prairie dog populations appear to fluctuate greatly from year to year, and have been reported to fluctuate by more than 50% between consecutive years[37]. Variation in density between years is likely driven by local factors such as, disease cycles, climate, and vegetation quantity and quality.

Burrowing owls are known to be in the area, and are dependent on prairie dog towns for nesting and burrow sites. Long term population trends (1968-2010), show burrowing owl population trends as declining, for the Southern Rockies Region (-0.1) and Colorado (-0.4). In the last decade (2000-2010), populations appear to be increasing for the Southern Rockies Region (+3.2), but remain declining for Colorado (-0.3)[38]. Little is known about their population status within the UFO or North Delta area. This species is also discussed in the Migratory Bird section.

Assumptions:

- Salt desert habitat that meets Standard 3 would provide suitable habitat for these species.
- Salt desert habitat has not crossed some threshold where it is no longer able to improve with changes in management.

Migratory Birds

Issues & Measures for Analysis

Resource Issue Area/Potential Effects:

- How would domestic grazing practices of the proposed action and alternatives affect vegetative cover and habitat suitability for migratory bird species?

Analysis Area:

- North Delta LHA area

CIAA Area:

- N Delta, Escalante, and Gunn Gorge LHA areas.

Impact Indicators:

- Acres meeting, meeting with problems, not meeting Standard.

Discussion

The plant communities, in the North Delta area and larger CIAA area, provide a variety of nesting habitats for a large number of different migratory bird species. Breeding bird surveys were conducted in the North Delta area in 2012.[39] This survey found 50 bird species present, with horned lark, common raven, and lark sparrow being the most detected species; western meadowlark, mourning dove, and rock dove were also detected frequently. Two nest sites were confirmed: prairie falcon and burrowing owl. Two non-native species were detected: European starling (1), and chukar (3).

For the purposes of this analysis, the U.S. Fish and Wildlife Service list of Birds of Conservation Concern was used as a tool to complete the analysis for this EA.[40] These species represent the remaining migratory birds with similar habitat types. Table 30 below contains the bird species used for this analysis, their general habitat within the area, and their general nesting and foraging habitat. Analysis will be conducted based on two groups: tree/cliff nesting species and ground/shrub nesting or ground foraging species. Two species, bald eagle, and ferruginous

hawk, are found in the area primarily in the winter months. In recent years, a few bald eagle nests have been found along the Gunnison River after many years of absence.

Table 30. Nesting and foraging habits of Birds of Conservation Concern for planning area[41]

	Species	*Nesting Vegetation*	*Nesting*	*Foraging*
Tree/Cliff Nesting Species	**Golden eagle+**	Cliff	Cliff	Soaring
	Peregrine falcon*	Cliff	Cliff	Aerial dive
	Prairie falcon+^	Cliff	Cliff	Aerial forager
	Bald eagle*	Forest/Woodland	Tree	Soaring
	Ferruginous hawk*	Grassland	Tree	Soaring
	Juniper titmouse+	Forest/Woodland	Tree Cavity	Foliage gleaner
	Lewis' woodpecker	Forest/Woodland	Tree Cavity	Aerial forager
Ground/Shrub nesting or foraging species	**Burrowing owl*+^**	Grassland	Burrow	Aerial dive
	Chestnut-collared longspur	Grassland	Ground	Ground
	Gray vireo+	Forest/Woodland	Shrub	Foliage gleaner
	Pinyon jay+	Forest/Woodland	Tree	Ground

* BLM Sensitive Species; Predominantly wintering only species; + Detected in the North Delta area during bird surveys; ^ Nesting confirmed during bird surveys.

Assumptions:

- Migratory bird species that rely on surface vegetation (grass, shrub) for nesting and/or foraging habitat may be impacted by grazing animals;
- Vegetation communities that meet Standard 3 would provide suitable habitat for these species;
- Birds of Conservation Concern represent other migratory bird species that also rely on similar vegetation/habitats for nesting and/or foraging habitat.

Desert and Rocky Mountain Bighorn Sheep

Issues & Measures for Analysis

Resource Issue Area/Potential Effects:

- How would domestic sheep grazing practices of the proposed action and alternatives affect the potential for disease transmission and disease outbreak interval?

Analysis Area:

- Allotments within North Delta area;

CIAA Area:

- 22 mile buffer of North Delta, Escalante and Gunnison Gorge LHA areas
- Based on the average distance a bighorn (Idaho, Rocky Mountain) will travel on foray outside of their Core Herd Home Range

Impact Indicators:

- Acres of sheep allotment that have predicted disease outbreaks <25 years;
- Number of days of overlap of domestic sheep grazing and breeding/rut season.

Discussion

Historically, the CIAA area saw unrestricted and unregulated domestic grazing, including sheep and goat grazing (see Vegetation and Range Management sections). Disease has often been implicated in periodic "all-age" die-offs, and sustained bouts of poor lamb survival in Colorado bighorns. In the late 1800s, die-offs were reported in bighorn sheep in the Tarryall Mountains,

and elsewhere, and in 1933 a die-off extirpated bighorns in what is now Dinosaur National Monument. In 1953, the state's largest bighorn population residing in the Tarryall and Kenosha Mountains experienced a die-off, caused by pneumonia, that reduced the population from an estimated 1,000 animals (some observers have said 2,000) to 30 within two years; the Tarryall-Kenosha epidemic likely extended from a 1952 outbreak on Pikes Peak. The causes of these early die-offs are hard to verify retrospectively, but contact with domestic livestock, that led to the introduction of exotic diseases and parasites, seems the most logical explanation. Agents of disease suspected to be responsible for historical epidemics have included; "scabies" (also called "scab" or "mange", and caused by mite infestations), "nasal bots" (parasitic fly larvae), "hemorrhagic septicemia" (later termed "pasteurellosis", a bacterial infection), and lungworms (a natural parasite of bighorns).

Exotic sheep species such as mouflon (*Ovis musimon*), and aoudads (or Barbary sheep; *Ammotragus lervia*) can potentially compete with bighorn, and introduce infectious disease. Escapes of exotic sheep and goats have occurred in the past, in the Battlement Mesa and Black Canyon of the Gunnison River[30] areas. Additionally, there is currently a feral domestic goat herd in Dominguez canyon.

Other problems, such as unregulated harvest, overgrazing, competition with other livestock, plant community succession, forestation of native ranges, and increasing human development of winter ranges have been identified as contributing to bighorn sheep declines either historically or presently.

CPW manage bighorn populations as either; Primary (Tier 1) or Secondary (Tier 2) populations[44]. Tier 1 herds are "regarded as those large (i.e., ≥100 animals for ≥90% of the years since 1986) native populations comprised of one or more interconnected herds, (in, or to be designated into, GMUs) that have received few (i.e., ≤50 animals total) if any supplemental releases of Rocky Mountain bighorn sheep in the past". Tier 2 herds "may represent indigenous or introduced bighorn sheep populations (and combinations thereof), that have less genetic diversity and more limited ranges, that may or may not be able to persist in sizable numbers in the face of various adversities".

Desert bighorn

There is debate whether desert bighorn sheep were native to Colorado[42]. Prior to CPW translocations that began in 1983, there are not records of bighorn sheep occurring in the Uncompahgre (S-62; D-E NCA area) herd since settlement in the 1880's. Evidence that desert bighorns might have been indigenous to the area comes entirely from archaeological sites in southwest Colorado that suggest Native Americans hunted bighorns in low elevations areas that would be more suitable for desert bighorns than Rocky Mountain bighorns.

Three herds make up Colorado's desert bighorn population: Black Ridge, Dominguez (Uncompahagre), and Dolores River. These bighorn herds are a high priority (Tier 1) for CPW, based on CPW's desert bighorn addendum[43].

Desert bighorn sheep, were released into the Big Dominguez Creek drainage in early to mid-1980s (20 bighorn from Arizona, 21 bighorn from Nevada), with additional releases occurring in

the Roubideau Creek drainage in 1991 (38 bighorn from Nevada)[42]. Population estimates increased to approximately, 175 in 2001. In 2001, there was a suspected disease outbreak, with subsequent all-age die-off. The population declined to 100 in 2004, but has increased to 150 in 2007[45], and 160 in 2012[43].

Rocky Mountain bighorn

It is difficult to estimate how many Rocky Mountain bighorn were present in Colorado in pre-settlement times. Explorers indicated, in their journals, great numbers of bighorn in both the mountainous areas, and along the Front Range[44]. Since the late 1800s the general trend of bighorn populations, in Colorado and throughout the west, has been downward. Historical, statewide estimates of bighorn were 7,230 in 1915, 3,200 in 1958, and 2,200 in 1970. There were an estimated 6,045 bighorn in Colorado in 1988, and an estimated 7,040 in 2007 statewide. The reason for increases in Colorado Rocky Mountain bighorn populations is CPW's longstanding effort to trap and translocate bighorn to establish new populations, or supplement existing populations. From 1945–2007, there were 147 releases of bighorn sheep in Colorado resulting in the translocation of 2,424 animals. Black Canyon of the Gunnison is a transplanted population. For the Black Canyon population, estimates in the late 1980s were approximately 50 bighorn, with an increase to 90 in the early 1990s. The population has been in decline since, with a current estimate of 30 bighorn[45]. Because population numbers are low, the Black Canyon population is considered by CPW to be a Tier 2 population[44].

Bighorn sheep (either species), are not known to use the North Delta area, and no CPW mapped habitat overlaps with the allotments. However, CPW does predict both desert and Rocky Mountain bighorn sheep suitable habitat within the North Delta area. Highway 50, may present some level of deterrent for movement from the Uncompahgre (Dominguez) population to the North Delta area. Additionally, Highway 92, as well as private lands, may present some level of deterrent for movement from the Black Canyon population to the North Delta area. Both desert and Rocky Mountain bighorn sheep have CPW mapped overall range within the 3-LHA areas (Table 31). Portions of the project area are located in proximity to occupied desert and Rocky Mountain bighorn sheep habitat, which may have conflicts with domestic sheep grazing. Only desert bighorn are considered to be BLM sensitive species, but both species have issues with disease transmission from domestic sheep. For ease of analysis, both species will be discussed here.

Table 31. Acres of bighorn sheep habitat within 3-LHA area, by species.

LHA Unit	*Acres Overall Range*	*Bighorn Species*
North Delta	5,100*	Desert
Escalante	60,186	Desert
Gunnison Gorge	43,280	Rocky Mountain

*Within the LHA unit, but not the North Delta Permit Renewal area.

The potential effect (probability of die-off and population viability) of intermingling of bighorn sheep with domestic sheep is well documented and recognized. Current science indicates that the bacteria that cause pneumonia in bighorn sheep populations, *Mycoplasma ovipneumoniae* and *Mannheimia haemolytica* , appear only to be transmitted between domestic and bighorn sheep when they come in direct contact (<30-foot separation)[46,47,48]. Besser et al. [49] and others,

identified that epizootic pneumonia of bighorn sheep is a devastating disease, and etiology regarding the bacterial respiratory pathogens is unclear. This is also the case in Colorado[50]. Transmission of *Mannheimia haemolytica* from domestic sheep to bighorn sheep was irrefutable, as demonstrated by Lawrence[47] and others, and provides justification sufficient for preventing range overlap, and potential association of domestic sheep and goats with bighorn sheep[51].

No one form of evidence can conclusively demonstrate that contact with domestic sheep frequently leads to die-offs of bighorn sheep populations in the wild. Taken together however, the experiments, and observations from the lab, and the field do indicate that contact of wild bighorn populations with domestic sheep does pose a risk of disease transmission, and die-offs in free-ranging bighorn populations. Lab experiments demonstrate the particular sensitivity of bighorn sheep to some pneumonia-causing bacteria. The controlled conditions, available in inoculation and pen experiments, show that healthy domestic sheep often carry bacteria that are fatal to bighorn sheep, and that they can transmit those bacteria through close contact. Finally, nearly a century of observations, in the field, supports the view that proximity to domestic sheep is a risk factor for bighorn sheep, due to disease transmission from domestic sheep to bighorn sheep.

Garde et al.[52] offers the following conclusions summarizing the risk to bighorn sheep from *Pasteurella spp*. and *Mannheimia spp*.

- These bacteria can cause pneumonia in bighorn sheep, but there are benign commensal strains in the upper respiratory tract, which have no harmful effects.
- Pathogens that are benign in domestic sheep can be lethal in bighorn sheep.
- The transference of pathogens from domestic to bighorn sheep has been documented in laboratory settings, with resulting mortality in bighorn sheep.
- Domestic sheep, goats, and llamas have been reported with these bacteria species.
- Wild sheep and mountain goats have been reported with these bacteria species.
- Transmission is by direct contact and aerosolization (e.g., fine mist from breathing).
- These bacteria species do not persist in the environment.
- Acute-to-chronic die-offs in bighorn sheep populations can result in low-to-100 percent mortality, although these bacteria can be present in healthy sheep.
- These bacteria are considered opportunistic, and can result in pneumonia outbreaks.
- These bacteria can cause clinical disease in domestic sheep and goats, but are rarely primary pathogens.

In summary, field observations suggest, bighorn sheep have a high probability of contracting fatal pneumonia following contact with domestic sheep, which has led to numerous independent experiments. These experiments provide strong corroboration that bighorn sheep have a high probability of contracting fatal pneumonia following contact with domestic sheep.

Given the substantial concern raised in the published literature over the past 30 years, management guidance has focused on the separation of these species to prevent disease transmission from domestic sheep to bighorn sheep[53,51,54,55,56,57]. Given these concern, the BLM UFO utilized the Risk of Contact (RoC) Model to generally assess the risks, within the North Delta area and beyond. The RoC model estimates the probability that foraying bighorn sheep will reach a domestic sheep allotment. However, within an allotment it is not possible to

determine where and when bighorn sheep would consistently occur or for how long. Use of some areas within an allotment may present less chance of contact with bighorn sheep than others, while some areas may have higher probability of occurrence (e.g., source habitats as defined by RoC User Guide). Consequently, because of this uncertainty, the RoC Model predicts potential interspecies contact by using the assumption that contact with an allotment results in interspecies contact. Of key importance to the model, the Core Herd Home Range (CHHR) defines the most important portion of a herd's use area, characterized by most (95%) of the use. By definition, where a CHHR overlaps an allotment, there is contact with the allotment, and the assumption is that one or more contacts per year may occur. It is recognized that stray domestic sheep could have implications for bighorn sheep herds, and in many rangeland settings may pose a risk of disease transmission as large as or greater than from foraying bighorn sheep. However, the bighorn sheep risk of contact tool[58] does not model the risk of stray domestic sheep, and the subsequent potential for contact with bighorn sheep.

With assistance from CPW biologists, the RoC model was run using the best available local bighorn population information to provide the parameters in the RoC model. However, much of the needed data was not available for individual bighorn populations, and assumptions were made given the available data. This may have resulted in spurious results for this area. Additional features in the landscape such as major highways, urban development and fragmented ownership between CHHR and the North Delta area may reduce the likelihood of bighorn foray into the area, but are not accounted for in the RoC model. More details on the methods can be found in the draft bighorn sheep appendix in the project record[59]. Results of the modeling effort are found below in Table 33 and Table 34.

The BLM-UFO recognizes the uncertainty regarding the relationship between the number of bighorn sheep contacts with a domestic sheep allotments, and predictions for disease transmission and outbreaks. Because of the uncertainty regarding the probability that contact of a bighorn sheep within an allotment will lead to disease outbreak within a population, modelers ran the disease model with assumptions for a range of values from 0.05 (1 in 20 contacts would result in a disease outbreak), to 1.00 (every contact would result in a disease outbreak). The range of values modeled include: 0.05, 0.10, 0.25, 0.50, 0.75, 0.90, and 1.00. Results for this calculation are found in Table 34.

In a review of other RoC model efforts, general trends appear to develop. The Payette National Forest Analysis[57] stated that total foray contact rates >0.04 annually (less than a 25 year interval) were deemed unacceptable, due to estimated disease return intervals, and subsequent impacts to long term viability to bighorn herds. Additionally, they assumed that 1 in 4 contacts (0.25) would result in disease transmission based on local information. The Rio Grande National Forest[60], stated that a disease event occurring within a bighorn herd every 25 years or less would result in High Risk to bighorn long term viability, and a low probability of population persistence. This would result in a bighorn sheep population that is constantly being exposed to ongoing disease transmission and resultant outbreaks.

During the bighorn breeding season, there may be an increase in attraction between wild and domestic sheep. Breeding season dates were provided by CPW bighorn sheep biologist during modeling efforts[64]. Dates of domestic sheep grazing with existing permits in the North Delta

area have no overlap with the desert bighorn breeding season (Table 32). However, all of the domestic sheep grazing allotments have anywhere from 12- 46 days of overlap with Rocky Mountain bighorn breeding season.

Bighorn sheep, particularly rams, make occasional long-distance movements beyond their CHHR. Forays are defined as any short-term movement of an animal away from and back to its CHHR[61]. This life-history trait can put bighorn sheep at risk of contact with domestic sheep, particularly when suitable habitats are well connected and overlap with domestic sheep use areas[62], or even when domestic sheep use is outside of CHHR areas. CPW provided local professional opinion on foray behavior for this area[63].

For Rocky Mountain bighorns, young rams tend to wander during the summer months, probably as ewes are lambing and raising new lambs the young rams disperse. Those young rams are leaving the family groups and may be trying to find other rams or bighorn groups. There is also some movement of rams pre-rut and during the rut, when rams are trying to find ewe groups for breeding.

Based on CPW collar data and professional opinion, desert bighorns generally appear to move more than Rocky Mountain bighorns, and move year round. Their seasonal habitats are not restricted by snow conditions, as much as Rocky Mountain bighorn. Also, since desert bighorns tend to lamb across a longer period of time in the spring, and even year round, the family structure seems more fluid through the year. Due to this, young rams probably disperse from the family groups during lambing and lamb rearing, especially in March through June. Rams probably start looking for ewes again for breeding in July, August, and September. During the winter in Escalante Canyon, it seems like the bigger ewe groups spend a lot of time with young rams, up to 5 and 6 year old rams, but you don't generally see real old rams with ewe groups outside of breeding season.

Because of this information, defining a bighorn foray season is problematic. So no analysis of domestic sheep grazing permit seasonal overlap with foray season will be conducted.

Table 32.Overlap of domestic sheep allotment permit dates with bighorn breeding season dates in domestic sheep allotments in North Delta.

Allotment Name	**Domestic Grazing Period**		**Breeding Season Overlap (Days)[a]**	
	Start	***End***	***Desert***	***Rocky Mountain***
Alkali Flats	1-Dec	28-Feb	No	Yes (31)
	1-Mar	20-Mar	No	No
Deer Basin/Midway	20-Dec	20-Mar	No	Yes (12)
Delta Pipeline	1-Dec	28-Feb	No	Yes (31)
	1-Mar	20-Mar	No	No
Petrie Mesa	9-Dec	20-Mar	No	Yes (23)
Point Creek	16-Apr	31-May	No	No
	16-Nov	10-Mar	No	Yes (46)
Wells Gulch	1-Mar	21-Mar	No	No
	1-Dec	28-Feb	No	Yes (31)

[a] Breeding seasons: Desert—August 1 to September 30; Rocky Mountain—November 1 to December 31[64]

Assumptions:

- Utilize RoC model results to inform relative risks for bighorn sheep;
- Allotments overlapping with Core Herd Home Range result in annual contact.
- 1 in 4 potential contacts results in disease outbreak;
- Potential disease events <25 years results in populations that never recover from initial disease outbreak and impact long term population viability.
- Given the assumption of 1 in 4 contacts results in a disease event, we generated relative risk rates using the following scheme.
  0-25 years High
  25-50 years Moderate
  50-75 years Some
  75-100 years Low
  >100 years Very Low

Within the larger CIAA analysis area (22-mile buffer around the 3-LHAs), there are currently 489,937 acres of domestic sheep grazing: 58% BLM, 36% USFS and 6% other lands (Table 35, Figure 10). Given the RoC model assumptions above, within CIAA domestic sheep areas, 195,827 acres (40%) is predicted that disease outbreaks will occur less than a 25 year interval (i.e. high risk). USFS lands were not included in the RoC model, so are not included in this assessment. Within these high risk areas, 179,070 acres (91%) is within BLM lands.

For the North Delta area, there are currently 47,140 acres of domestic sheep grazing: 88% BLM,

12% other lands (Table 35, Figure 9). Given the RoC model assumptions, within the North Delta domestic sheep areas, 25,690 acres (54%) is predicted that disease outbreaks will occur less than a 25 year interval (i.e. high risk). Within these high risk areas, 20,868 acres (81%) is within BLM lands. Within this permit renewal, 4 domestic sheep allotments result in high risk, 3 allotment pieces (2 portions of Deer Basin) in moderate risk, and 1 allotment and 1 allotment piece (1 portion of Deer Basin) in very low risk of contact (Table 34).

Table 33. RoC Model Results for Bighorn Risk of Contact with Allotments (Probability that a bighorn sheep will intersect an allotment).

Allotment	***Probability of Contact***		***Rate of Contact***		
	Ram	**Ewe**	**Ram**	**Ewe**	**Herd**
Alkali Flats*	0.0093 [a]	0.0028	0.1161	0.0066 [b]	0.1228 [c]
Deer Basin/Midway*	0.0081	0.0018	0.0967	0.0042	0.1009
Deer Basin/Midway*	0.0001	0.00002	0.00060	0.00003	0.0007
Deer Basin/Midway*	0.0110	0.0026	0.1356	0.0058	0.1414
Delta Pipeline*	0.0331	0.0073	0.2747	0.0127	0.2875
Dirty George	0.0019	0.0008	0.0051	0.0006	0.0057
Petrie Mesa*	0.0368	0.0096	0.3397	0.0171	0.3568
Point Cr*	0.0276	0.0061	0.3273	0.0142	0.3415
South Branch	0.0022	0.0009	0.0134	0.0010	0.0145
Ward Cr/Doughspoon	0.0512	0.0142	0.2571	0.0158	0.2728
Wells Gulch*	0.0145	0.0076	0.1797	0.0177	0.1974

* Current domestic sheep allotments

[a] Given that a ram is on foray, there is a 0.9% probability that it will contact this allotment.

[b] Given the probability of ram on foray, predicts a rate of 0.7 ram contacts with allotment in 10 years.

[c] Given the probability of foray of bighorn in the population, predicts a rate of 12.3 contacts with allotment in 10 years.

Table 34. Predicted years between potential disease events for allotments, based on RoC Model Results.

Allotment	*Herd Rate of Contact*	*Years Between Contact*	*Years Between Potential Disease Events*							*Risk of Disease Outbreak*
			1:1 (1.0)	**1:1.1111 (0.9)**	**1:1.3333 (0.75)**	**1:2 (0.50)**	**1:4 (0.25)**	**1:10 (0.10)**	**1:20 (0.05)**	
Alkali Flats*	0.1228	8	8	9	11	16	33	81	163	Moderate
Deer Basin/Midway *	0.1009	10	10	11	13	20	40	99	198	Moderate
Deer Basin/Midway *	0.0007	1536	1536	1707	2048	3073	6145	15363	30726	Very Low
Deer Basin/Midway *	0.1414	7	7	8	9	14	28	71	141	Moderate
Delta Pipeline*	0.2875	3	3	4	5	7	14	35	70	High
Dirty George	0.0057	176	176	196	235	353	706	1765	3529	Very Low
Petrie Mesa*	0.3568	3	3	3	4	6	11	28	56	High
Point Cr*	0.3415	3	3	3	4	6	12	29	59	High
South Branch	0.0145	69	69	77	92	138	277	692	1384	Very Low
Ward Cr/Doughspoon	0.2728	4	4	4	5	7	15	37	73	High
Wells Gulch*	0.1974	5	5	6	7	10	20	51	101	High

* Current domestic sheep allotments

[a] From Table 33, last column; [b] 1/Herd Rate of Contact

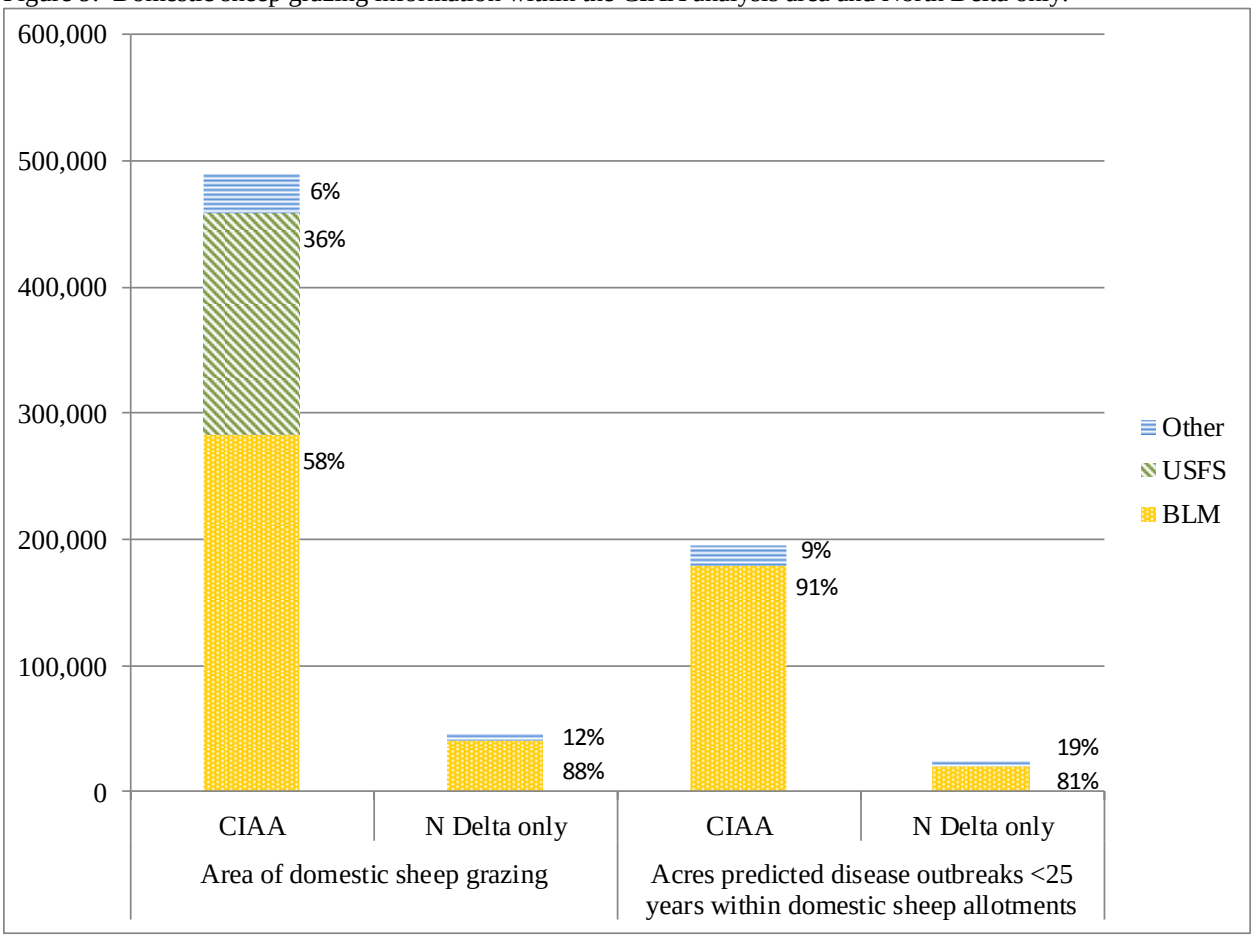
[c] Grey shaded cells for allotments show potential disease event rates more frequently than 25 years.

[d] Given the assumption of 1 in 4 contacts results in a disease event, relative risk rates are set at High—<25 years; Moderate—25-50 years; Some—50-75 years; Low—75-100 years; Very Low— >100 years

Table 35. Domestic sheep grazing information within the CIAA analysis area.

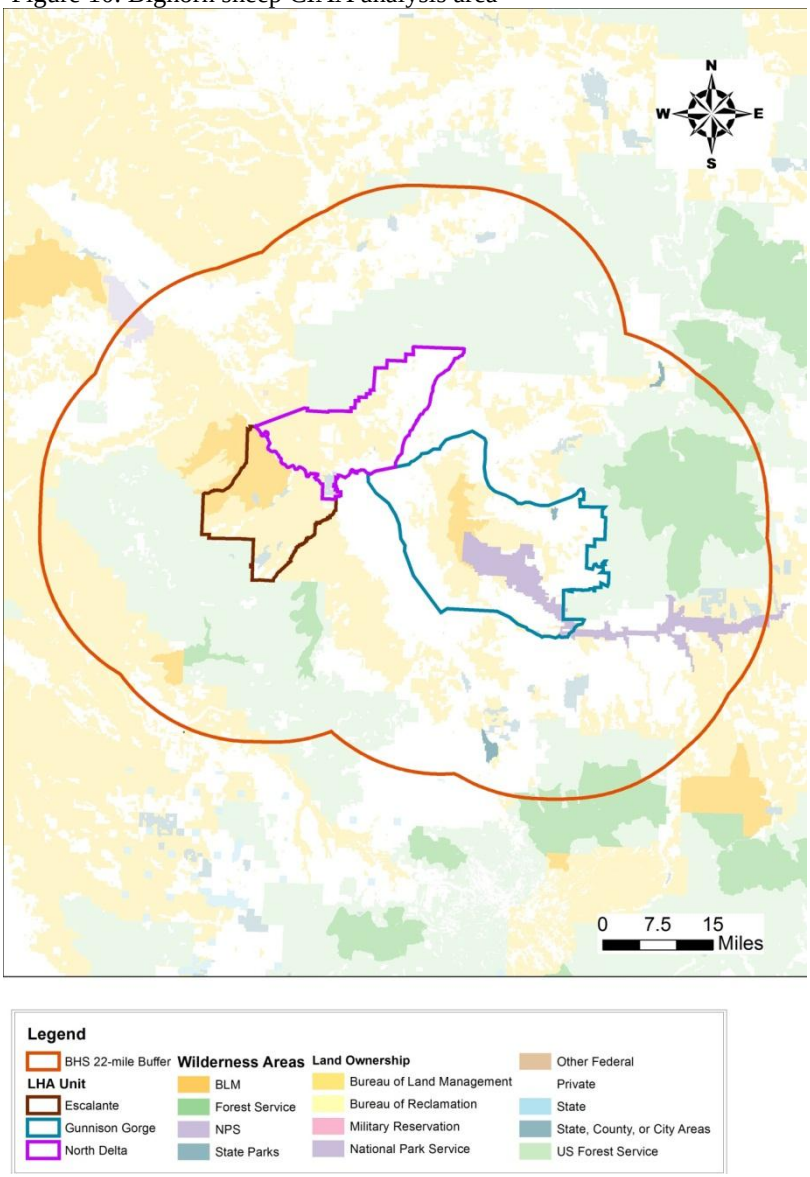
Land Ownership	*Area of domestic sheep grazing (Acres [% of CIAA])*		*Acres predicted disease outbreaks less than 25 years within domestic sheep allotments*	
	CIAA	N Delta only	CIAA	N Delta only
BLM	284,348	41,473 [15%]	179,070	20,868 [12%]
USFS	174,342	0	Unavailable	0
Other	31,247	5,667 [18%]	16,757	4,822 [29%]
Total	489,937	47,140 [33%]	195,827	25,691 [13%]

Figure 9. Domestic sheep grazing information within the CIAA analysis area and North Delta only.



*RoC model was not run for USFS allotments to predicted risk of contact

Figure 10. Bighorn sheep CIAA analysis area



Environmental Consequences

Because effects are difficult to measure for the numerous wildlife species that may be in the area, for most wildlife species, effects are discussed in a general manner in this section. For a few species, additional effects are discussed below.

General Wildlife

Impacts Common to all Grazing Alternatives

Grazing has been called the most widespread influence on native ecosystems of western North America and represents a routine disturbance to vegetation which may result in alteration of species composition of vegetation communities, disruption of ecosystem functioning and alteration of ecosystem structure.[65] As described in the Vegetation section, historically these rangelands in the North Delta LHA unit have transitioned across thresholds and have moved towards other often degraded vegetative states, as compared to associated ecological sites Salt-

desert shrub ranges were estimated to have a carrying capacity of 5 acres/AUM, and have transitioned to at least 18 acres/AUM[Error! Bookmark not defined.]. With the semiarid climate, relatively ragile vegetation, soils that are slow to recover from disturbance combined with historical heavy use and some current mismanagement, land health has been impacted which has affected the stability of ecological sites, modified vegetative composition, and has hampered BLM's ability in the past to bring about change in these fragile environments. As described in the Vegetation section, if a vegetation type is in a lower stable state, it will not respond to simple changes in grazing management or even the removal of grazing.

Grazing activities from livestock presence or human activities, associated with livestock management, may have direct impacts to wildlife species through competition of food and habitat. Direct effects would be difficult to quantify. We assume that healthy native vegetation equates to healthy terrestrial wildlife habitat and will provide for healthy terrestrial wildlife populations. The response of native wildlife to grazing varies by habitat and species. These activities may cause individual wildlife to be displaced from areas, and depending on the level and timing of the activity, could have impacts to survival and/or reproductive efforts, i.e. disrupt breeding through trampling of nest/burrows or cause adults to leave nests/burrows and young.

Indirect impacts include modification of habitat for terrestrial wildlife species. Grazing may affect the composition of plant communities, and thus wildlife habitat, in essentially two ways: (1) active selection by herbivores for or against a specific plant group, and (2) differential vulnerability of plant group to grazing[65]. Grazing can also exert an impact on animal populations, usually due to indirect effects on habitat structure and prey availability.[66,67,68,69,70] Grazing can destabilize plant communities by aiding the spread and establishment of exotic species. Livestock help spread exotic plant species by dispersing seeds in fur and dung; opening up habitat for weedy species; and reduce competition from native species by eating them. As shown in the Land Health Assessments (2002 and 2012) for this area, the vegetation, and by extension the wildlife habitat, in the area, is in decline with causal factors at least partially attributed to historic and current grazing. With continued grazing, in this already compromised vegetative community, terrestrial wildlife habitat quality will continue to be limited at some level. Depending on the level of grazing, some improvements may be seen over the long term. Until improvement is seen, in the vegetation community, wildlife populations are not expected to have quality habitat, or have the resources for a stable or increasing population. Under all alternatives, recovery of the native vegetation is a long term prospect.

The presence of livestock can also be a vector for diseases, which impact native wildlife species, especially, wild ungulates. Under the grazing alternatives, domestic livestock will remain in the North Delta area, and disease trends for wild ungulates would continue. These will be discussed in more detail below under the pronghorn section, and in the TES species section relative to bighorn sheep. These issues may also be present at some level for other wild ungulate species in the area (mule deer, elk).

Proposed Action When compared to the No Action (Continued Management) alternative, direct impacts to wildlife species will continue at some level as described in Impacts Common to all Grazing Alternatives. By reducing AUMs, the level of direct disturbance would be reduced (e.g. fewer animal unit months equals decrease in disturbance). By reducing utilization targets and AUMs to more closely match carrying capacities, impacts to vegetation communities, and thus

terrestrial wildlife habitat, would be reduced. With the modification to the carrying capacities (AUMs) in the Alkali Flats, Deer Basin/Midway, Delta Pipeline, Petrie Mesa and Point Creek allotments, the allotments should start to make marginal, but minor undetectable changes within 10-50 years, towards meeting land health standards (See Vegetation Section for more details). The remaining allotments (Wells Gulch, South Branch, Dirty Gorge, Ward Creek/Dough Spoon) did not have land health issues associated with current livestock management for Standard 3, Vegetation. These allotments should continue with current trends.

American Pronghorn

General effects to pronghorn have already been described under General Wildlife, and above under Proposed Action. Specific for pronghorn, when compared to the No Action alternative, by reducing utilization from 50% (No Action) to 35% (Proposed Action), these allotments are expected to improve vigor on perennial grasses, forbs and shrubs already established, which should in turn allow for incremental increases in seed production, propagation, and seedling establishment over the next 25-100 years, depending upon weather patterns and other outside disturbances (see Vegetation section). With reduced AUMs, impacts from grazing to habitat suitability should be reduced from the No Action alternative. Grazing activities continue to occur during the fawning season (15-May through 1-July[71]) (Table 36). With reductions in domestic grazing utilization on native vegetation and as the vegetation improves, it is expected that pronghorn food (desirable shrubs in the winter, and forbs in the spring and summer) and fawn hiding cover will improve over time. This should provide for both more residual cover in those allotments that graze outside of fawning season, as well as maintaining cover during the fawning season for those two allotments that graze during that critical period. With continued domestic livestock presence in the area, high rates of BT and EHD in the pronghorn population would continue. Better nutrition and hiding cover may improve fawn:doe ratios and fawn survival rates. Current population trends will likely continue or see slight improvement.

Table 36. CPW mapped pronghorn habitat within the project area relative to the Proposed Action.

Allotment Name	*Public Land Allotment Acres*	*% Allotment in Downward Trend*[a]	*Pronghorn Habitat*		*Days of Overlap with Fawning season*
			Overall Range Acres (% of Allotment)	Winter Concentration Acres (% of Allotment)	
Alkali Flats*	8,900	99	8,900 (100%)	1,484 (17%)	0
Deer Basin/Midway*	11,701	87	9136 (78%)	631 (13%)	0
Delta Pipeline*	6,029	70	1595 (26%)	0	0
Petrie Mesa*	2841	0	1014 (36%)	78(52%)	0
Point Creek*	1586	62	1586 (100%)	0	17
Ward Creek/Dough Spoon+	17272	56	7833 (45%)	922 (9%)	Max 33 days
Wells Gulch*	10362	0	9679 (93%)	0	0

*Domestic Sheep Allotments; + Cattle Allotments

[a] Pg 19 *in* BLM. 2015. North Delta Land Health Assessment 2013-2014.

Migratory Birds

General effects to migratory birds have already been described under General Wildlife. Specific to migratory birds, when compared to the No Action alternative, by reducing utilization from 50% (No Action) to 35% (Proposed Action), these allotments are expected to improve vigor on native vegetation already established, which should in turn allow for incremental increases in seed production, propagation, and seedling establishment over the next 25-100 years, depending upon weather patterns and other outside disturbances (see Vegetation section). With reduced AUMs, impacts from grazing to habitat suitability should be reduced from the No Action alternative. Grazing activity continues in one allotment during the breeding season, but no changes in dates are proposed from the No Action alternative (Table 37). Direct effects, due to take of migratory bird reproduction, would be the same as the No Action alternative.

Table 37. Days of overlap between proposed grazing season dates and migratory bird breeding season (15-May through 15-July).

Allotment Name	***No Action***			***Proposed Action***		
	Domestic Grazing Period		***Days Overlap***	**Domestic Grazing Period**		***Days Overlap***
	Start	***End***		***Begin***	***End***	
Alkali Flats*	1-Dec	28-Feb	0	1-Dec	1-Mar	0
	1-Mar	20-Mar	0			
Deer Basin/Midway	20-Dec	20-Mar	0	1-Dec	1-Mar	0
Delta Pipeline	1-Dec	28-Feb	0	1-Dec	1-Mar	0
	1-Mar	20-Mar	0			
Petrie Mesa	9-Dec	20-Mar	0	1-Dec	1-Mar	0
Point Creek	16-Apr	31-May	17	16-Apr	31-May	17
	16-Nov	10-Mar	0	16-Nov	1-Mar	0
Wells Gulch +	1-Mar	21-Mar	0	1-Dec	10-Mar	0
	1-Dec	28-Feb	0			

Desert and Rocky Mountain Bighorn

General effects to bighorn have already been described under General Wildlife. Similar to the No Action alternative, since there is no bighorn CHHR within the North Delta area, there are no effects to core habitat areas. As stated earlier, the use of the RoC model was run using the best available local bighorn population information to provide the parameters in the model, however much of the needed data was not available. This may result in spurious model results. Specific for bighorn, when compared to the No Action alternative, by continuing domestic sheep presence in the area, there will continue to be 25,691 acres predicted from the RoC model to have disease outbreaks in local bighorn populations on an interval less than every 25 years. If this model result is accurate, this results in those local populations of bighorn sheep never recovering from those disease outbreaks. Additional features in the landscape such as major highways, urban development and fragmented ownership between CHHR and the North Delta area may reduce the likelihood of bighorn foray into the area, but are not accounted for in the RoC model. Depending on the actual foray rates for this area (given the potential habitat fragmentation

factors of the landscape), disease interval rates may be longer, providing some time for population recovery.

Overlap of domestic sheep grazing permit grazing dates and Rocky Mountain bighorn sheep breeding season dates would continue (Table 38), with potential for attracting foraying bighorn during that time period. This alternative increases the number of days of overlap, for Rocky Mountain on two allotments (Deer Basin/Midway, Petrie Mesa). However, permit terms and conditions for domestic sheep (BH-S, BH-M and BH-H) will

- decrease attraction of domestic herds to foraying bighorn;
- decrease the likelihood of disease exposure by domestic sheep;
- increase herder/permittee reporting.

These terms and conditions should reduce the likelihood that domestic sheep and bighorn will come into contact, therefore reducing the likelihood that disease transmission takes place. Additionally, bighorn sheep design features will encourage additional changes through time to reduce the risk of contact between domestic sheep and bighorn.

Under this alternative, population trends for bighorn would be expected to continue. Currently, the Uncompahgre (Dominguez; desert bighorn) herd is increasing, but still relatively small (160). The Black Canyon (Rocky Mountain bighorn) herd appears to be stable, but at very low numbers (30). Without additional augmentation, the Black Canyon population may eventually, no longer be present.

Table 38. Overlap of domestic sheep allotment permit dates with bighorn breeding season dates.

Allotment Name	**No Action**				**Proposed Action**			
	Domestic Grazing Period		**Breeding Season Overlap (Days)[a]**		**Domestic Grazing Period**		**Breeding Season Overlap (Days)**	
	Start	***End***	***Desert***	***Rocky Mountain***	***Begin***	***End***	***Desert***	***Rocky Mountain***
Alkali Flats*	1-Dec	28-Feb	No	Yes (31)	1-Dec	1-Mar	No	Yes (31)
	1-Mar	20-Mar	No	No				
Deer Basin/Midway	20-Dec	20-Mar	No	Yes (12)	1-Dec	1-Mar	No	Yes (31) +19
Delta Pipeline	1-Dec	28-Feb	No	Yes (31)	1-Dec	1-Mar	No	Yes (31)
	1-Mar	20-Mar	No	No				
Petrie Mesa	9-Dec	20-Mar	No	Yes (23)	1-Dec	1-Mar	No	Yes (31) +8
Point Creek	16-Apr	31-May	No	No	16-Apr	31-May	No	No
	16-Nov	10-Mar	No	Yes (46)	16-Nov	1-Mar	No	Yes (46)
Wells Gulch +	1-Mar	21-Mar	No	No	1-Dec	10-Mar	No	Yes (31)
	1-Dec	28-Feb	No	Yes (31)				

* Includes Huff allotment in the No Action Alternative; + Includes Dominguez Rims allotment in the No Action Alternative

[a] Breeding seasons: Desert—August 1 to September 30; Rocky Mountain—November 1 to December 31[64]

Summary

In summary, the Proposed Action would result in undetectable changes in the short-term. Success would be to stop the ongoing degradation of habitat, and see improvements in shrub vigor and recruitment. In the long-term, the area should start to make marginal, but minor undetectable changes within 10-50 years toward meeting land health standards for vegetation and improvements in wildlife habitat.

Alternative 2 (No Grazing)—

When compared to the No Action alternative, removal of grazing from the North Delta area would reduce the direct and indirect impacts from grazing (see General Wildlife above), and slowly move allotments toward meeting land health standards (See Vegetation Section). With the removal of grazing from the area, disruptive activities from livestock presence or human activities associated with livestock management would no longer occur, and those direct impacts to wildlife species through competition of food and habitat would be reduced. The livestock vector for diseases would also be reduced in the area for native wildlife species, especially wild ungulates (mule deer, elk, pronghorn, bighorn). These will be discussed in more detail below under pronghorn, and bighorn sheep.

Indirect impacts, of habitat modification, for terrestrial wildlife species through domestic grazing animals, would be removed. However, the vegetation community problems that most likely impact wildlife populations or contribute to the suppression of populations such as exotic plant competition with native vegetation, low native vegetation diversity, low shrub cover, low shrub vigor, and the presence of noxious weeds, would slowly improve with the reduction in forage use. The recovery of the plant communities, and thus terrestrial wildlife habitat, may take 120 years or more. Until improvement is seen in the vegetation community, wildlife populations are not expected to have quality habitat or have the resources for stable to increasing populations. Other disturbances from right-of-ways, and OHV would continue to impact terrestrial habitat.

With the removal of livestock from the North Delta area, a vector for diseases which impact native wildlife species would be removed locally. Wild ungulates that migrate outside of the North Delta area may still be exposed in adjacent areas. Since the pronghorn population seems to be highly infected with BT and EHD, it may take a number of years for this disease to subside within the population.

American Pronghorn

When compared with the No Action alternative, with removal of domestic grazing on native vegetation and as the vegetation improves, it is expected that pronghorn food (desirable shrubs in the winter, and forbs in the spring and summer) and fawn hiding cover will improve over time. Additionally, with the removal of domestic livestock from the area, infection rates of BT and EHD in the pronghorn population should decline over time. Effects to pronghorn populations are expected to be similar to the Proposed Action, but should occur sooner, but will be at least partially tied to vegetation recovery.

Desert and Rocky Mountain Bighorn

Similar to the No Action alternative, since there is no bighorn CHHR within the North Delta area, there are no effects to core habitat areas. When compared with the No Action alternative, with removal of domestic sheep presence in the area, 25,691 acres would no longer be predicted to have disease outbreaks in local bighorn populations on an interval less than every 25 years. Given that these bighorn populations are located outside of the North Delta area, and will continue to have exposure from other sources, it is uncertain what affect this would have on the populations.

Summary

Removing grazing from the North Delta land health area would eliminate the direct effects and reduce the indirect impacts from grazing to wildlife and wildlife habitat. The vegetation community problems that most likely contribute to the suppression of wildlife populations such as exotic plant competition, low native vegetation diversity, low shrub cover, low shrub vigor, and the presence of noxious weeds would slowly improve with the reduction in forage use. With past effects of limited precipitation and 120 years of grazing disturbance, improvement in wildlife habitat would take place over the next 100+ years. Other disturbances from right-of-ways, OHV, and wildlife on vegetation would continue to impact wildlife habitat. Additionally, the livestock vector for diseases would also be reduced in the area for native wildlife species, especially wild ungulates (mule deer, elk, pronghorn, bighorn).

No Action Alternative

Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Direct and indirect impacts would be expected to continue at similar levels. Over time, a greater percentage of wildlife terrestrial habitats would be expected to degrade to a not meeting rating, which could begin to have population level impacts to wildlife species, especially special status species.

Pronghorn

General effects to pronghorn have already been described under General Wildlife. Specific for pronghorn under the No Action alternative, by continuing domestic grazing utilization levels at 50%, allotments are expected to continue the existing trend for vegetation and disease. Generally, the North Delta area has low cover of native vegetation. Areas with problems with perennial grasses, forbs and shrubs would continue to decline (see Vegetation section). Indirect effects from grazing activities may include reduced habitat suitability through the year-round reduction in hiding cover for fawns as well as reduced nutrition for does. Of importance to pronghorn reproduction is shrubs in the winter and forbs in the spring and summer. This has impacts to a doe's ability to produce fawns and for a fawns ability to hide and survival from predators. Additionally, grazing activities during the fawning season (15-May through 1-July[71]) would reduce cover during this critical time period (Table 39). With no changes in domestic grazing utilization on native vegetation, it is expected that pronghorn food (desirable shrubs in the winter, and forbs in the spring and summer) as fawn hiding cover will continue to decline. This would result in both reduced residual cover in those allotments that graze outside of fawning season, as well as reduced cover during the fawning season for those two allotments that

graze during that critical period. With continued domestic livestock presence in the area, high rates of BT and EHD in the pronghorn population would continue. Fawn:doe ratios will continue to be low. Fawn survival rates are not expected to improve. Current population trends will likely continue or see declines. Without additional augmentation, this population may eventually no longer be present in the North Delta area.

Table 39. CPW mapped pronghorn habitat within the project area relative to the No Action alternative.

Allotment Name	*Public Land Allotment Acres*	*% Allotment in Downward Trend*[a]	*Pronghorn Habitat*		*Days of Overlap*
			Overall Range Acres (% of Allotment)	*Winter Concentration Acres (% of Allotment)*	
Alkali Flats*	12,433	99	11,373 (91%)	2,771 (22%)	0
Deer Basin/Midway*	11,701	87	9,136 (78%)	631 (13%)	0
Delta Pipeline*	6,029	70	1,595 (26%)	0	0
Petrie Mesa*	2,841	0	1,014 (36%)	78 (52%)	
Point Creek*	1,586	62	1,586 (100%)	0	17
Ward Creek/Dough Spoon+	17,272	56	7,833 (45%)	922 (9%)	Max 32 days
Wells Gulch*	16,879	0	13,739 (81%)	0	0

* Domestic Sheep Allotments; + Cattle Allotments

[a] Pg 19 *in* BLM. 2015. North Delta Land Health Assessment 2013-2014.

Migratory Birds

General effects to migratory birds have already been described under General Wildlife.

Tree/Cliff Nesting Species

Effects to tree/cliff nesting species (Table 30), from the No Action alternative, would be generally limited to indirect impacts to habitat for prey species through modification of habitat (habitat). Depending on the location and height of nesting substrate, disruptive effects may also occur.

Ground/Shrub Nesting or Ground Foraging Species

Effects to ground/shrub species (Table 30), from No Action alternative, would be both direct and indirect in nature. Direct impacts may include trampling and disruptive activities. Modification of vegetation through grazing during the breeding season may cause breeding efforts to be reduced. Only one allotment proposes grazing during the breeding season (Table 37). Direct effects, due to take of migratory bird reproduction, may occur in the Point Creek allotment during those years when grazing takes place during the breeding season.

Indirect effects from the grazing alternatives may include modification of habitat (vegetation) for nesting, foraging and/or prey species. Both grazing alternatives will remove vegetation at some

level. Given that the current health of the vegetation is poor, current habitat suitability is assumed to be limited for both grazing alternatives.

Desert and Rocky Mountain Bighorn

General effects to bighorn have already been described under General Wildlife. Specific for bighorn under the No Action alternative, indirect effects are anticipated from bighorn sheep on foray, outside the CHHR, that reach the North Delta area domestic sheep allotments and return to their CHHR. By continuing domestic sheep presence in the area, there will continue to be 25,691 acres predicted to have disease outbreaks in local bighorn populations on an interval less than every 25 years. Given model issues described above, under this alternative, current trends in bighorn sheep disease outbreaks would continue, but we do not have a good estimate with available data. Overlap of domestic sheep grazing permit windows and Rocky Mountain bighorn sheep breeding season dates would continue, with potential for attracting foraying bighorn during that time period. Population trends for bighorn would be expected to continue to decline. Without additional augmentation, these populations may eventually no longer be present in the North Delta area.

Summary

In summary, the No Action alternative would result in undetectable changes in the short-term. However, current land health trends for vegetation would continue:

- areas meeting land health standards may continue to do so under this action;
- areas meeting with problems with static trends may remain stable;
- areas meeting with problems that have downward trends would continue to degrade; eventually joining the not meeting category;
- areas not meeting standards would remain, with number of acres static or increasing.

This alternative would not meet Public Land Health Standard, for Standard 3 Vegetation, and would not provide for suitable wildlife habitat for many species of wildlife.

Finding on the Public Land Health Standard for plant and animal communities (partial, see also Vegetation; Invasive, Non-native Species; and Wildlife, Aquatic) and for Threatened & Endangered species (partial, see also Threatened, Endangered, and Sensitive Plant Species):

Current land health conditions rate native plant and animal communities (Standard 3) in the North Delta land health unit as 9,951 (16%) meeting, 37,270 (60%) meeting with problems, and 13,318 (22%) not meeting. Current land health conditions rate special status species (Standard 4) in the North Delta land health unit as 12,844 (20%) meeting, 33,798 (55%) meeting with problems, and 12,324 (20%) not meeting. The proposed action, if properly implemented, is expected to stop the current rate of habitat degradation caused by domestic sheep grazing for the salt desert shrub habitat in the North Delta LHA unit. In addition, minor incremental improvements in native species cover and composition is anticipated over the next 25-120+ years. Such improvements may be most pronounced in those sites meeting with problems with downward trends, which may result in more suitable wildlife habitat. For those lands that are not meeting, such anticipated improvements may be undetectable, and may in fact require active restoration to have measurable improvements in native species cover and composition.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES PLANTS (includes a finding on Standard 4)

Affected Environment:

The analysis area for impacts to threatened, endangered, and sensitive plant species includes the North Delta LHA area totaling 61,449 acres of BLM administered public lands, where both direct and indirect effects occur. However, some of the indirect and cumulative effects also occur for the same species analyzed within the Escalante, Gunnison Gorge, and a small portion of the Roubideau land heath units. The scope of the analysis, for indirect and cumulative effects include: the section 7 range of the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), and four LHA areas, totaling 278,300 acres of BLM administered lands. These areas are Escalante, North Delta, and Gunnison Gorge LHA areas, and 7,872 acres of the Canal allotment in the Roubideau LHA unit totaling 286,172 acres. Further, the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) is known to occur or has suitable habitat for occupation.

The Endangered Species Act (ESA), as amended (16 U.S.C. 1531-1534) mandates the protection of species listed as threatened or endangered of extinction, and the habitats which they depend. Section 7 of the ESA clarifies the responsibility of federal agencies to utilize their authorities, to carry out programs for the conservation of listed species. In addition, federal agencies must consult with the U.S. Fish and Wildlife Service (Service) to ensure that any action authorized, funded, or carried out by the agency is "…not likely to jeopardize the continued existence of any endangered species, or threatened species, or result in the destruction, or adverse modification of habitat of such species…". The Uncompahgre Field Office (UFO) utilizes the U.S. Fish and Wildlife Service Information, Planning, and Conservation System (IPaC), to generate the most current species list, to analyze the effects of a Proposed Action on threatened, endangered, and candidate species, and designated critical habitat for these species.[72] Additionally, the BLM has a state-wide list of Sensitive Species for management consideration. In accordance, with BLM Manual 6840, the goal of management of these species is to prevent a trend toward federal listing or loss of viability.

A spatial analysis was conducted to assess which allotments within the North Delta LHA unit have potential to intersect with special status plant species.[73] After review of both BLM special status plant species occurrences, and Colorado Natural Heritage Program records, the only threatened, endangered, or BLM sensitive plant species known to occur within the North Delta LHA unit is the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). Based on these results, the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) is the only species that will be considered for impact analysis.

Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) is a small ball or barrel-shaped cactus, endemic to Montrose, Delta, Mesa, and Garfield Counties in western Colorado. The occurrences are spread over approximately 1,700 square miles, with an estimated 618,000 acres of potential habitat.[74] This species has two population centers, one associated with the Gunnison River and its tributaries near the City of Delta, and the other with the Colorado River and its tributaries near Debeque, Colorado. Colorado hookless cactus *(Sclerocactus glaucus*, Threatened)was originally listed as threatened on October 11, 1979 (44 FR 58868), with revised listing due to taxonomic changes published on September 15, 2009 (74 FR 47112). Critical

habitat has not been proposed for this species. The Recovery Outline released by the Service in 2010[74] presents an updated and thorough review of the species' status.

Habitat

Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) grows primarily in the salt desert shrub community, found on alluvial terraces, associated with the Gunnison and Colorado Rivers. Soils are commonly derived from Mancos shale, often overlain with a thin layer of alluvium, and range from fine silty clay to coarse gravel, often with volcanic cobbles and boulders scattered on the surface. Typical elevations for the species range from 4,593 to 6,562 feet above mean sea level (Heil and Porter 2004).[75] Within the North Delta LHA unit two small populations were identified, in 2014 that occur between 6900 and 7200 feet. The dominant co-occurring plant species include shadscale (*Atriplex confertifolia)*, black sage (*Artemisia nova)*, cactus (*Opuntia* spp.), strawberry hedgehog cactus (*Echinocereus triglochidiatus)*, galleta (*Pleuraphis jamesii)*, and Indian ricegrass (*Acnatherum hymenoides)*. Populations also occur in sagebrush, and the transition zone between sagebrush and pinyon-juniper woodland. Within these communities, Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) is often found under small nurse shrubs, especially shadscale (*Atriplex confertifolia)*. In many populations Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) co-occurs with exotics, especially cheat grass (*Bromus tectorum)*, and/or Halogeton (*Halogeton glomeratus)*, and along some drainages dominated with Russian knapweed (*Acroptilon repens)*. While the cactus has been observed, in these degraded sites with competitive annual species, often only large mature individuals are present and recruitment appears to be inhibited by the competition. This suggests, perhaps recruitment in the most degraded sites only occurs in the most abundant moisture years. Observations, made at three historic occurrences in 2014, suggest that in sites where Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) once occupied, that are now dominated by invasive annuals that the cactus population can either be extirpated or greatly suppressed. According to the 2002 North Delta LHA report, the Mancos shale communities that the cactus occurs in to have little resilience to disturbance due to soil chemistry and structure and the small amount of available moisture.[76]

Threats

The primary threats identified for this species in the Recovery Outline are, destruction, modification, fragmentation, or curtailment of habitat and range; collection; livestock grazing and trampling; predation; herbicides and pesticides; hybridization; and climate change. The factors contributing to habitat destruction and modification include: (1) mineral and energy development; (2) utility corridors; (3) invasive species; (4) off-road vehicle (ORV) recreation; (5) water developments; (6) livestock grazing and trampling; and (7) herbicides and pesticides.[74] Specific to the North Delta LHA area, current and historic livestock grazing, coupled with the secondary effect of invasive species dominance over substantial portions of suitable habitat within the unit represent the greatest threat to the species. Utility corridors have resulted in past impacts to the species, and those impacts continue today as new infrastructure is added, and existing infrastructure is maintained. Future impacts from utilities development is anticipated, as the Westwide Energy Corridor EIS[77] designated approximately 8,000 acres of the unit as a major energy development corridor. OHV impacts have greatly impacted the cactus, and its habitat in the North Delta Open OHV area, and some new impacts from OHV activity has been observed around Star Nelson Rd., and within the Devils Thumb WSA, and immediately south of the Devils thumb feature outside the WSA.

Abundance, Viability, and Demography

The North Delta LHA unit has some of the highest concentrations of Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) in the Uncompahgre field office. The 2014 North Delta LHA report, found there were 1,246 separate occurrences of the species. Approximately 3,000 new individual cacti have been documented within the unit, and 89 previously unknown occurrences since 2011. The most significant and abundant populations occur in the Wells Gulch allotment, and in the Deer Basin portion of the Deer Basin/Midway allotment.

The UFO has been revisiting historic (>20 years old) occurrences for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), since 2013, and found in most cases that populations remain on the landscape, and appear to be viable. Between, 2013-2014 five population density estimates were conducted, on known historic occurrences, with no data in 20 plus years. The results of those sampling efforts are summarized in Table 40.

Table 40 Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) population density estimates (point-in-time monitoring)

Site	Estimated SCGL/m^2 in plot +/- 30%	Total # SCGL Plot Estimate +/- 30%
EOR* 10382	0.15	120
Gravel Pit*	0.26	190
Guzzler*	0.1	123
Picnic*	0.19	460
McCarty Bench*	0.38	248

*indicates monitoring locations within the Escalante LHA Unit.

During this effort, two historic occurrences were found to have been extirpated, and one occurrence had been reduced from more than 300 individual cacti in 1993 to one remaining individual in 2014. Suspected causes for these observations were sheep bed grounds, over grazing by domestic sheep, and the subsequent dominance of the sites by invasive annuls, including cheatgrass, annual wheatgrass, and halogeton. All three sites exhibited abundant sheep droppings, tufts of wool, and severe hedging of the reaming shrubs.

Monitoring by the BLM UFO prior to 2009 is summarized, in *Sclerocactus glaucus Monitoring Projects and Trends in the BLM Uncompahgre Field Office*, 1978 – 2009[78], between 1983 and 1986. The UFO inventoried Colorado hookless cactus at 31 sites in Montrose, Delta, and Mesa Counties, finding a total of 4,979 plants. In 1993, they resurveyed 26 of these sites, with data recovered for only 21sites. The estimates of individuals at any given site were not entirely comparable between years, due to divergent monitoring methods and the lack of permanent plots, however 12 of the sites showed a stable or upward trend, and 9 showed a downward trend. Declines were greater than 50 percent at several sites.

In 1986, the UFO collaborated with CNAP to establish seven 1 m^2 monitoring plots in the Escalante Canyon ACEC, with a total of 36 individuals across all plots. When the plots were revisited in 1993, an 11 percent reduction in plant number and a shift towards the seedling and mature size classes was found. In 2010, the UFO was unable to relocate these plots.

Field observations by agency and private consultants indicate, Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) population size can change rapidly (England 2008, pers. comm., cited in BIO-Logic 2008; Conner 2011, pers. comm.) The North Delta LHA report from UFO noted that: "Population fluctuations for the Uinta Basin hookless cactus, now Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), are much more rapid than originally expected, and in some cases significant recruitment events, such as the one in the early nineties near Escalante Creek, result in substantial increases in the number of individuals in the population. Cactus borers, and other mortality factors seem to keep this species' populations in a constant state of change".[76] Monitoring of the federally listed congener *Sclerocactus wrightiae* has also shown extreme fluctuations in mortality rates between years, often correlated with changes in precipitation.[79]

In general, monitoring has not yet been conducted long enough to provide substantial documented information on population trends. For those purposes, BLM UFO established four long term demographic monitoring plots for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). Two sites were established in the North Delta LHA, one west of Star Nelson road, in an area based on observation that is relatively lightly used by domestic sheep, and another near Devils Thumb Golf Course, where moderate to heavy sheep use had been observed. The desired monitoring objective is to attempt to tease out cactus population trends with varying levels of domestic livestock use, relative to other environmental stressors such as, climactic variation, herbivory, insects, and disease. The other two locations were established in the Escalante LHA unit, in cattle allotments, to answer similar questions associated with cattle use.

Figure 11 Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) population trend North Delta LHA unit 2011-2014

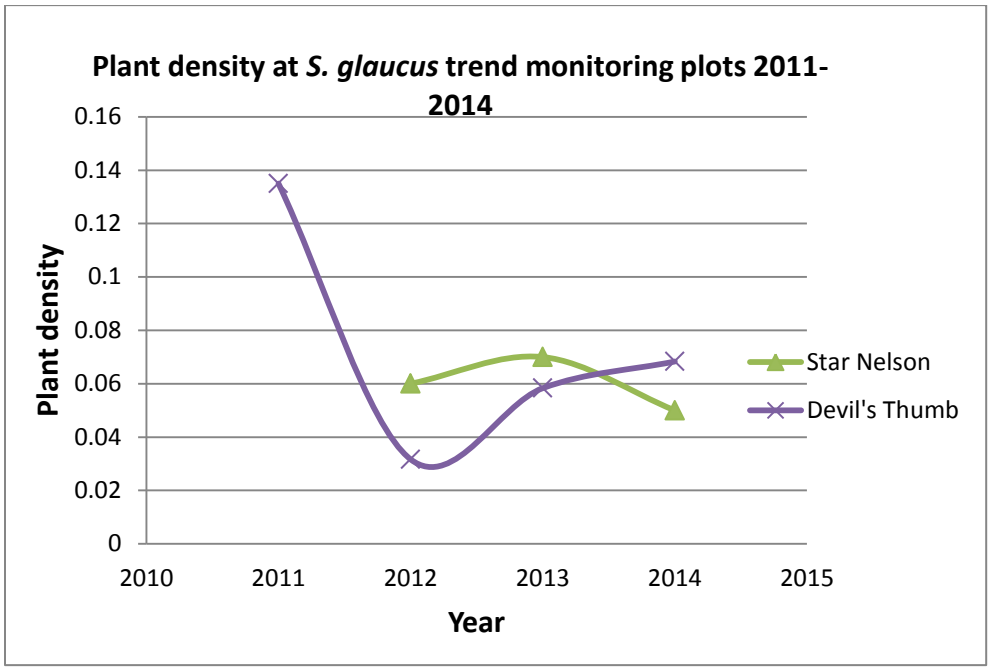


Figure 11 depicts North Delta Colorado Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) trend for both Star Nelson and Devils Thumb monitoring plots, since their respective establishment. The Devils Thumb plot experienced a significant decline ($t=3.21$, $p<0.05$) in plant density, from 2011 to 2012, due to the substantial drought that occurred from late 2011 through the spring of 2012. Much of the mortality experienced, at this site, was attributed to rodent herbivory and drought related mortality. This site has seen slight, yet not statistically significant increases in plant density from '12-'13 ($t=0.45$ $p=0.66$), and a significant increase in mean plant density between 13'-14' ($t=2.48$, $p=0.028$). Meanwhile, the Star Nelson plot experienced a similar, yet not significant, ($t=0.40$ $p=0.70$) increase in mean plant density, between 2012 and 2013, and a minor ($t=1.52$ $p=0.15$) decline in plant density between 2013 and 2014. At this point, it is difficult to see any clear trend relative to livestock grazing impacts, versus other environmental stressors such as, precipitation levels and herbivory. Both sites are similar, in that they are not overly dominated by invasive annuals, and yet the Devils Thumb site which does see more relative use by sheep saw a significant increase in mean plant density between '13-'14, while the Star Nelson site which sees lower relative use by sheep saw a minor, yet not significant, decline in mean plant density between '13-'14. A similar site needs to be established, with grazing excluded, to serve as a control coupled with a longer term data set, before we can effectively tease out the effects of sheep grazing in the North Delta LHA.

Land Health Findings

Land Health Standard 4 determinations have changed since the preceding Land Health Assessment of 2000-2001, where all lands were found to be meeting. The acreage of lands not meeting, and meeting Standard 4 with problems, has increased greatly. This is largely a result of a new, more intensive approach for documenting this standard, than was used in the past. Now,

Standard 4 determinations are more closely tied with Standard 3 determinations, which can indicate habitat concerns, where there are TES species, especially when detailed population information is not known. In past assessments, lands were typically judged as meeting Standard 4 when specific information on TES species was lacking. Approximately, 22% of the area allotted for grazing is now found to be meeting for Standard 4, while a majority of the area is either meeting with problems (57%) or not meeting (21%). Areas with known occurrences of Colorado hookless cactus were determined to not meet Standard 4 (61.3%), or meet with problems (30.7%), based on increasingly degraded habitat from exotic annuals, and/or decreasing native species cover and composition. Only 4.3% of occurrences were found to be on lands meeting land health standards as shown in the Table 41 and Figure 12.

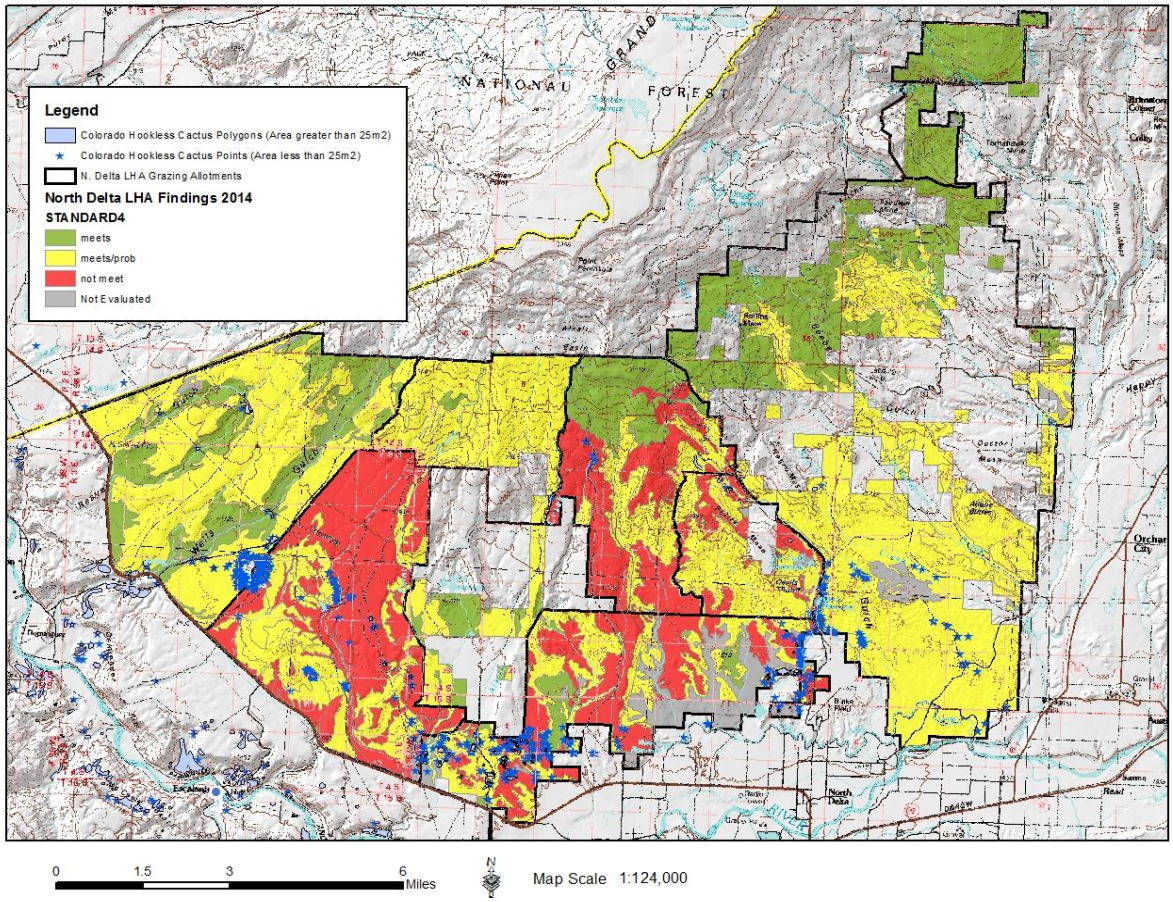
Table 41 Colorado Hookless cactus Land Health Findings

Land Health Status	# of Colorado Hookless Cactus Occurrences	%
Meets	54	4.3
Meets with Problems	764	61.3
Not Meet	382	30.7
Unknown/Not Evaluated	46	3.7

Identified specific habitat indicator issues and concerns, for upland vegetation communities, that resulted in lands not meeting or meeting with problems, for Colorado hookless cactus included: exotic plants competing and /or degrading habitat, low perennial cool season grass cover, low perennial forb cover, low native vegetation diversity, low shrub vigor, low shrub cover, and the presence of noxious weeds. The factors that most likely threaten Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) populations or contribute to the suppression of populations are: exotic plants competition, which was observed over 38, 211acres (62% of the LHA unit), low native vegetation diversity observed on 31,696 acres (41% of the unit), low shrub cover observed on 11,560 acres (19% of the unit), low shrub vigor observed on 15,435 acres (25% of the unit), and the presence of noxious weeds observed on 4,786 acres (8% of the unit). As discussed before, the presence of invasive annuals and noxious species, at high plant community composition and cover levels, coupled with low native plant community diversity, not only results in direct competition for resources with the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) and other native species, but also likely suppresses annual cactus recruitment, in all but the most abundant precipitation years. Conditions for plant establishment, in arid rangelands, occur infrequently and irregularly.[80] Non-native plant species, often have faster growth rates, higher fecundity, more efficient dispersal of seeds, higher fitness, and higher resource use efficiency, than native species. Due to these life history characteristics, non-native plant species may be able to more rapidly colonize new ground, and become established at disturbed sites more readily than native species, potentially preventing subsequent colonization by certain native species.[81] As stated, in the habitat discussion, the cactus is often associated with nurse shrubs. These nurse shrubs are thought to facilitate the growth and development of other plant species beneath their canopy. This is attributed to the benign microhabitats, that are more favorable for seed germination, seedling recruitment, adjusting light, temperature, soil humidity and nutrients,[82]and the protection from grazing animals, when compared to their surrounding environment,. Thus plant communities, which constitute occupied and suitable habitat, with low shrub cover and/or vigor, likely contribute to the suppression of cactus

populations in the North Delta LHA unit. Plant communities occupied by the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) in the North Delta LHA unit, with low shrub cover and vigor, represent not only less opportunities for cactus establishment, but also offer less protection from mortality induced stochastic events, such as drought or excessive herbivory from rodents and cactus borers.

Figure 12. Colorado hookless Cactus Distribution, N. Delta LHA Unit



Trends

It is difficult to assess trend from the previous assessment in 2002 for standard 4, to determine if conditions are improving or declining, with current management because of the changes in how this standard is now assessed. Therefore, with the plant community/ habitat issues discussed above, using standard 3 (upland plant communities), as a surrogate, one can infer habitat trends for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). For a detailed discussion, of general vegetation and habitat trends for the salt desert shrub communities, in the North Delta LHA, refer to the Vegetation and Terrestrial Wildlife sections of this document. A majority of this landscape unit has concerns and issues with Standard 3. These concerns are most pronounced in salt desert shrub vegetation, and in the Alkali Flats, Deer Basin-Midway, Delta Pipe-line, Petrie Mesa, and Point Creek allotments. The status of vegetation in the salt desert shrub ecosystem within the unit, is of particular concern, since vegetation reflects habitat

conditions important for maintaining populations of the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened).

Large areas of the North Delta landscape were identified as having problems, or not meeting Standard 3 in the original LHA from 2001. Measured trend data since that time indicates conditions have been static to downward on these lands, over the past 12 years. Overall, acres of lands not meeting Standard 3, in the salt desert shrub communities, increased by 9% from 2001-2014, now comprising 22% of the North Delta LHA unit, and 94% of the lands identified as not meeting, exhibit downward trend from ’01-‘14. Furthermore, 60% of the unit meets standard 3 with problems, much of those acres are salt desert shrub communities occupied by Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). Of the lands identified, as meeting with problems, 56% exhibit downward trends from ’01-’14, suggesting a greater percentage of occupied Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat is at risk of further degradation, and being classified, as not meeting land health standards.

Environmental Consequences:

Impacts Common to the Proposed Action and No Action Alternatives--Physical damage to Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) individuals, from sheep bedding, and moderate to heavy trampling, by livestock have been observed.[76,78,83, 74] Even when direct mortality does not occur, trampling damage may make individual plants more susceptible to desiccation, or herbivory from insects, or small mammals. No evidence of browsing by livestock on this species has been reported, nor observed.

Direct effects to plants will occur through trampling, especially during concentrated use from salting/supplement, watering, trailing, and bedding. Although trampling of Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) by livestock has been observed, there are no data to indicate, it occurs commonly, or has been responsible for detectable landscape-scale changes, in abundance or distribution of the species. Not all trampled plants will die. Based on field observations, plants can survive some damage and partial uprooting, and non-lethal damage may be compensated for through budding. However, if damaged plants direct scarce resources towards tissue repair and away from reproduction, and if damage makes them vulnerable to desiccation, herbivory, and/or disease, they may have reduced reproductive output for some length of time as well as increased mortality compared to undamaged plants. Physical impacts to cacti from activities secondary to grazing, such as vehicle use for herding, supplying camps, or maintenance of range improvements, may also kill or impair plants.

Indirect effects to Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) from grazing program-related changes in habitat have occurred, and are well documented in the North Delta LHA. Observations indicate, in the Mancos shale soils, the species commonly occurs, and are vulnerable to surface disturbance. Once disturbed, the vegetation community is slow to recover and often becomes dominated by annual weeds.[84] Kitchen and Hall**Error! Bookmark not defined.** noted, hat assuming the rates of change, in salt desert shrub community composition were somewhat constant, it would take at least 120 years after elimination of spring grazing to fully restore the salt desert shrub community to levels found in areas excluded from grazing.[85] As noted above in the Affected Environment section, BLM has inferred these kinds of community level changes were caused by the intensive grazing practiced historically. Based on the declines in land heath

from 2001- to 2014, current management of livestock grazing is continuing to cause such disturbance. Within the North Della LHA area, these impacts are most pronounced in the Alkali Flats, Delta Pipeline, Deer Basin/Midway, and Petrie Mesa allotments. Mature Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) do exist in areas with a high percent cover of weedy species such as, cheatgrass and halogeton. Monitoring of Colorado hookless cactus in the Colorado River Valley have found no recruitment of cacti documented, in areas where cheatgrass infestations are dense, possibly because seedlings are unable to compete with weeds for water and nutrients.[86]

Proposed Action – For all allotments analyzed the application of the design features PTE 1-5 will minimize direct impacts to cactus populations from permitted livestock grazing by prohibiting livestock concentrations such as, bedding and trailing and other management actions such as water developments within 200 meters of known populations.

The entire *Alkali Flats* allotment is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), and the entire allotment either meets with problems or does not meet land health standards. The proposed action reduces the Active AUMs by 30%, from the previous ten year average actual use, as well as reduces utilization levels from 50% to 35% and implements delineated use areas with periodic rest. These changes are expected to result in reductions in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat degradation compared to the no action alternative. Over the entire allotment, improvement in shrub health, vigor, and cover can be anticipated with reduced annual use coupled with periodic annual rest. Habitat improvements are expected to be most pronounced on 2,260 acres, of lands meeting with problems with downward trends attributed to current livestock management over the next 25-50 years, given the slow recovery of these plant communities. These areas still have all functional groups (grass, forb, shrub) represented, and are not as dominated by invasive annual and noxious weeds. The proposed action is also expected to result in minor incremental increases in native grass and forb cover and composition, coupled with shrub recruitment on 5,675 acres of lands not meeting LHA standards, due to current livestock management. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment, and detectable change may not be realized for well beyond 120 years. These proposed changes, if the grazing program is effective at addressing the plant community issues, and institutionalized into the future, should result in 5,675 acres of improving cactus habitat conditions, which in turn, may lead to population expansion over time.

The entire low elevation portion of *Deer/Basin-Midway Allotment*, and the open salt desert shrub slopes of the upper elevation portion of the *Deer Basin-Midway* Allotment is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). The proposed action reduces the Active AUMs by 30%, from the previous ten year average actual use, as well as reduces utilization levels from 50% to 35%, and implements delineated use areas with periodic rest. These changes are expected to result in reductions in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat degradation compared to the no action alternative. Over the entire allotment improvement in shrub health, vigor and cover can be anticipated with reduced annual use coupled with periodic annual rest. Habitat improvements are expected to be most pronounced on approximately 6,200 acres of lands, meeting with problems with downward

trends, which were attributed to current livestock management over the next 25-50 years given the slow recovery of these plant communities. These areas still have most functional groups (grass, forb, shrub) represented, and are not as dominated by invasive annual and noxious weeds. The proposed action is also expected to result in minor incremental increases in native grass and forb cover and composition coupled with shrub recruitment on approximately 3,000 acres of lands not meeting LHA standards due to current livestock management. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment and detectable change may not be realized for well beyond 120 years. The lowest elevations of this allotment may never recover due to complete domination by invasive species and the absence of native species. In these cases, active restoration may be necessary to move these areas towards a higher ecological standard. These proposed changes if the grazing program is effective at addressing the plant community issues and institutionalized into the future, should result in 3,000 acres of improving cactus habitat conditions which in turn may lead to population expansion over time within the allotment.

The entire portion of the *Delta Pipeline* allotment below 7,000 feet is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) including substantial populations inside the Adobe Badlands WSA. The proposed action reduces the Active AUMs by 30%, from the previous ten year average actual use, seasonal utilization levels for cactus habitat remain unchanged from the previous permit of 35% and implements delineated use areas with periodic rest. These changes are expected to result in reductions in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat degradation compared to the no action alternative. Over the entire allotment improvement in shrub health, vigor, and cover can be anticipated with the incorporation of periodic annual rest. Since seasonal utilization is unchanged from the previous permit improvements in shrub vigor and cover may not be as pronounced as is anticipated in the other salt-desert shrub allotments analyzed. Habitat improvements are expected to be most pronounced on approximately 1,670 acres of lands meeting with problems with downward trends attributed to current livestock management over the next 25-50 years given the slow recovery of these plant communities. These areas still have most functional groups (grass, forb, shrub) represented and are not as dominated by invasive annual and noxious weeds. The proposed action is also expected to result in minor incremental increases in native grass and forb cover and composition coupled with shrub recruitment on approximately 2,800 acres of lands not meeting LHA standards due to current livestock management. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment and detectable change may not be realized for well beyond 120 years. These proposed changes if the grazing program is effective at addressing the plant community issues and institutionalized into the future should result in 2,800 acres of improving cactus habitat conditions which in turn may lead to population expansion over time within the allotment.

The entire *Petrie Mesa* allotment is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) including substantial populations inside the Adobe Badlands WSA. The proposed action reduces the Active AUMs by 30%, as well as reduces utilization levels from 50% to 35%, and implements delineated use areas with periodic rest. These changes are expected to result in reductions in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat degradation compared to the no action alternative. Over the entire allotment improvement in shrub health, vigor, and cover can be anticipated with reduced annual use

coupled with periodic annual rest. Habitat improvements are expected to be most pronounced on approximately 2,000 acres of lands meeting with problems with downward trends attributed to current livestock management over the next 25-50 years given the slow recovery of these plant communities. These areas still have most functional groups (grass, forb, shrub) represented and are not as dominated by invasive annual and noxious weeds. The proposed action is also expected to result in minor incremental increases in native grass and forb cover and composition coupled with shrub recruitment on approximately 770 acres of lands not meeting LHA standards due to current livestock management. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment and detectable change may not be realized for well beyond 120 years. The lowest elevations of this allotment may never recover due to complete domination by invasive species and the absence of native species. In these cases active restoration may be necessary to move these areas towards a higher ecological standard. These proposed changes if the grazing program is effective at addressing the plant community issues and institutionalized into the future should result in 770 acres of improving cactus habitat conditions which in turn may lead to population expansion over time within the allotment.

The entire *Point Creek* allotment is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) however, there are no occurrences of the species documented on BLM administered public lands. Records search does not indicate any formal survey has been conducted within the allotment. There are substantial occurrences all around the allotment and on private lands within the allotment therefore, BLM assumes that the allotment is occupied by Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) for management purposes. The proposed action reduces the Active AUMs by 38%, as well as establishes a seasonal utilization limit of 35% where there was previously none. These changes are expected to result in reductions in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat degradation compared to the no action alternative. Over the entire allotment improvement in shrub health, vigor, and cover may occur with reduced annual use however, no season long rest is proposed for the allotment. Habitat improvements are expected to be most pronounced on approximately 993 acres of lands meeting with problems with downward trends which were attributed to current livestock management over the next 25-50 years, given the slow recovery of these plant communities. These areas still have most functional groups (grass, forb, shrub) represented and are not as dominated by invasive annual and noxious weeds. The proposed action is also expected to result in minor incremental increases in native grass and forb cover and composition as well over the same time frames.

The entire portion of *Ward Creek-Doughspoon* allotment below 7,000 feet is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened). The allotment meets Land Health Standards on 3,974 acres and meets with problems on 12,382 acres of the allotment. The proposed action does not adjust the Active AUMs but does reduce the utilization levels from 50% to 35%. This will result in some nominal increases in native grass and forb cover and composition across the allotment. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment and detectable change may not be realized for well beyond 120 years. Because the land health issues are associated with the open OHV area, rights-of-ways, old contour furrow treatments, and historic

grazing, the proposed action is unlikely to ameliorate the existing habitat conditions for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened).

The entire portion of the *Wells Gulch* allotment below 7,000 feet is considered suitable habitat for Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) and supports the largest populations of Colorado hookless cactus found in the North Delta unit. The proposed action reduces utilization levels from 50% to 35%, and continues to maintain delineated use areas with periodic rest. These changes are expected to continue to result in improving Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat conditions which have been recognized with the no action alternative. Over the entire allotment, continued improvement in shrub health, vigor, and cover can be anticipated with reduced annual use coupled with periodic annual rest. Further, habitat improvements are expected to be most pronounced on approximately 6,900 acres of lands meeting with problems with static trends over the next 25-50 years given the slow recovery of these plant communities. Similar incremental increases in native grass and forb cover and composition increases can be expected to those observations made between 2002-2014. However, the level of dominance by invasive annuals and warm season galleta grass will greatly inhibit or slow native species recruitment and detectable change may not be realized for well beyond 120 years. Continuing current livestock manage coupled with a reduction in seasonal utilization from 50%-35 should result in continued improving cactus habitat conditions and maintenance of the existing large populations present on this allotment.

Even with the implementation of the design features (PTE1-6) and the proposed changes in grazing management, damage to and loss of cacti from trampling and range management activities may occur in localized areas in the North Delta Unit, especially where livestock use is concentrated. Surface disturbance to the clay soils may also continue to alter habitat characteristics and function in areas of concentrated use. These effects are likely to be measurable and detectable in some locations and therefore, cannot be considered insignificant and discountable. Because of the direct, indirect, and secondary effects of livestock grazing described the BLM Uncompahgre Field Office has determined that livestock grazing and management authorized by the Proposed Action or No Action Alternative "may affect, and is likely to adversely affect" the Colorado hookless cactus.

The UFO consulted with the USFWS on the programmatic nature of BLM authorized grazing for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened), Clay-loving wild buckwheat (*Eriogonum pelinophilum*), and the DeBeque Phacelia (*Phacelia submutica*) as required by Section 7 of the ESA, and prepared a Biological Assessment[87] to evaluate likely impacts to federally listed or proposed threatened or endangered species.

The USFWS issued a Biological Opinion on November 15, 2012 regarding BLM Authorized Grazing and its impacts on federally protected plants, including the proposed conservation measures.[88] The USFWS Biological Opinion is that the Proposed Action is not likely to jeopardize the continued existence of the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened).

Alternative 2--Removing grazing from the North Delta land health area would eliminate the direct effects and reduce the indirect impacts to Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) from grazing. The vegetation community problems that most likely threaten

Colorado hookless cactus populations or contribute to the suppression of populations such as exotic plant competition, low native vegetation diversity, low shrub cover, low shrub vigor, and the presence of noxious weeds would slowly improve with the reduction in reduction in forage use. With limited precipitation and 120 years of grazing disturbance, improvement in Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat would take place over the next 120 ±years. Other disturbances from rights-of-ways, OHV and wildlife would continue to impact Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) and its habitat.

No Action Alternative – Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Direct and indirect impacts would be expected to continue at similar levels. A greater percentage of occupied Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) habitat would be expected to be degraded to a not meeting rating which could begin to have population level impacts to the cactus in the North delta LHA unit. Should this alternative be selected the term grazing permits would need to have Plant T&E Terms and Conditions (PTE1-6) applied to all allotments occupied by the cactus to conform to the Programmatic Biological Opinion for the

Effects Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) from the Bureau of Land Management Livestock Grazing Program or reinitiate consultation with FWS for the No Action alternative.

Finding on the Public Land Health Standard for Threatened & Endangered species: Current land health conditions rate special status species in the North Delta land health unit as 12,844 meeting, 33,798 meeting with problems, and 12,324 not meeting. The proposed action, if properly implemented, is expected to stop the current rate of habitat degradation caused by domestic sheep grazing for the Colorado hookless cactus *(Sclerocactus glaucus*, Threatened) in the North Delta LHA unit. In addition, minor incremental improvements in native species cover and composition is anticipated over the next 25-120+ years. Such improvements may be most pronounced in those sites meeting with problems with downward trends which may result in more suitable habitat that is conducive to Colorado hookless cactus *(Sclerocactus glaucus*, Threatened)occupation and persistence. For those lands that are not meeting such anticipated improvements may be undetectable and may in fact require active restoration to have measurable improvements in native species cover and composition.

WILDLIFE, AQUATIC INCLUDING THREATENED, ENDANGERED, AND SENSITIVE SPECIEs (includes a finding on Standard 3 & 4)

Affected Environment:

The scope of the analysis for direct and indirect effects to aquatic species including TE&S species includes the watersheds in the North Delta LHA area extending from the top of Grand Mesa to their termination at the Gunnison River. These 9 HUC 6 watersheds total approximately 181,272 acres.

Threatened, Endangered, and Sensitive Species

The Gunnison River is designated as critical habitat for Colorado pikeminnow (*Ptychocheilus lucius*) and Razorback sucker (*Xyrauchen texanus*) from the confluence with the Uncompahgre

River down to the confluence with the Colorado River. Colorado pikeminnow also have been found in the Gunnison River upstream from the confluence with the Uncompahgre River as far as the Hartland Diversion Dam (approximately 4 miles from the confluence). Few wild razorback suckers are known to occur in the Gunnison River; however, the population is being augmented by stocking both in the Colorado and Gunnison Rivers. Colorado Parks and Wildlife and USFWS have both suggested that numbers of these two species appear to be low in the immediate reach below Hartland dam in part due to the Gunnison River above Hartland dam being too cold (cold water fishery) for these warm water fish to inhabit.

The Humpback chub (*Gila cypha*) and Bonytail (*Gila elegans*) are not known to occur in the UFO. However, one individual was captured in 2007 in the Gunnison River in a canyon bound reach at river mile 22, approximately 5 miles north of the UFO planning area boundary. Based on this information, there is a possibility the species occurs within the Gunnison River, or may spend part of its life cycle in the river well below the project site. The Proposed Acton would not occur within designated critical habitat. The Gunnison River is also known to contain populations of the BLM sensitive flannelmouth sucker(*Catostomus latipinnis*), bluehead sucker(*Catostomus discobolus*), and roundtail chub (*Gila robusta*).

The primary threats to the four Colorado River endangered fish and the three BLM sensitive fish are stream flow regulation and habitat modification; competition with and predation by nonnative fishes; and pesticides and pollutants.[89]

General Aquatic Wildlife & Sensitive Amphibians
According to both BLM and Colorado Parks and Wildlife sampling efforts the only perennial stream within the North Delta LHA unit know to support fish is Alkali Creek which forms the boundary between the Delta Pipeline and Deer Basin/Midway allotments. Alkali Creek is tributary to the Gunnison River. The stream was found to be in habituated by cutthroat trout in 2013. The stream was then sampled to collect fin clips from resident cutthroat trout for genetic analysis and lineage identification, as well as determine upper and lower fish distribution limits.

Fish densities are low but well distributed throughout the sampled reach of Alkali Creek which extended from the forest boundary down to about one mile above the Lone Starr Ditch diversion. A population estimate has not been completed at this time. The riparian area is narrow, but vegetation along the stream is lush and dense, and is comprised of horsetail, red osier dogwood, wolf current, sedges/rushes, water leaf, hemlock, and wood rose. The stream substrate is a mix of gravels, cobbles, and small boulders. Substrates are slightly embedded. The stream is a steep Rosgen A/B channel type with step pools, and a mix of riffles and swift runs. Large, deep pools are limited. Fish were concentrated primarily in the pools sampled. Water quality for this stream is presented in that section of this document.

Based on genetic testing, the fish in Alkali Creek are Yellowstone cutthroat trout. Suggesting that they are in fact a non-native species introduced to the creek at some point in the past.

Little is known about amphibian population trends in the North Delta LHA. Amphibian observations made in the North Delta LHA unit include northern leopard frogs, wood house toad, and tiger salamanders. Aquatic invertebrates observed during various aquatic sampling efforts

include mayflies, stoneflies, dragon fly larvae, and caddisflies. These species all depend upon depend on aquatic habitats for all life process.

Land Health Findings
For the purposes of assessing habitat quality for aquatic species Standard 2 Riparian and Standard 5 Water Quality is utilized as a surrogate to assess Standard 3 since all aquatic wildlife occurring with the unit are dependent upon the quantity and quality of the water and associated riparian habitat for all life process. Refer to the North Delta LHA, the Riparian, and Surface Water affected environments of this document. In general the findings for the limited aquatic habitats within the LHA unit are that riparian habitats are not being impacted by domestic livestock use, and that water quality does not exceed standards for aquatic life use.

Environmental Consequences:

Impacts Common to all Alternatives Threatened, Endangered, and Sensitive Species: The proposed action and alternatives will have no connection to stream flow regulation and habitat modification or competition with and predation by nonnative fishes. Within the North Delta LHA unit domestic livestock grazing occurs on the marine sediments of the Mancos Shale formation that contain high levels of selenium. Research has shown that high selenium levels may adversely affect reproduction and recruitment.[90,91,92,93,94,95] In 2009 the Fish and Wildlife Service issued a Programmatic Biological Opinion (PBO) under the Endangered Species Act to address the recovery of endangered fish species. The PBO addresses the Bureau of Reclamation's Aspinall Unit operations as well as all other public and private uses in the Gunnison Basin. The primary requirements of the PBO are the reoperation of the Aspinall Unit and the implementation of a Selenium Management Program. The BLM is a signatory to a Memorandum of Understanding with the Bureau of Reclamation, State of Colorado, and local irrigation companies, to assist in the development and implementation of a long-range plan. In the MOU, the BLM agreed to, "Evaluate options to conform to a goal of no net new selenium loading from land exchanges, sales, and other actions involving public lands."

The impacts to water quality from the proposed action and alternatives and how they relate to selenium loads in the Gunnison River and how those selenium loads might impact the four Colorado River endangered fish are analyzed in detail in the Surface Water Quality section of this document. The analysis in the Surface Water section of this document concluded that:

- The Mancos shale rangelands found in the North Delta LHA area contribute very little selenium to the Gunnison River (0.1 pounds/year)[96] compared to the irrigated agricultural lands contribution
- Selenium loads in the Gunnison River have dropped 28.6 percent since 1986 due primarily to improved irrigation practices and lining canals and ditches in the contributing areas of the Gunnison and Uncompahgre basins
- During the period of declining trends for selenium loads in the Gunnison River, rangeland health conditions haven't changed as shown in the two recent land health surveys for North Delta

- The long term recovery of watershed health, from grazing related impacts, compared to the 10 year scope of this grazing permit, is expected to have very little direct reductions in salinity or selenium contributions to the Gunnison River
- The conclusion that all alternatives considered including no grazing and continuation of current management is expected to have similar levels of selenium contribution to the Gunnison River.
- In accordance with the PBO for the reoperation of the Aspinall Unit, and in conformance with the MOU signed by BLM no net new selenium loading is anticipated from the proposed action

The livestock grazing management contemplated under the Proposed Action and alternatives will not result in increased selenium loading delivered to the Gunnison River from the North Delta LHA unit which has been documented to have affects to the four endangered fish. Based on these conclusions the BLM Uncompahgre Field Office has determined that livestock grazing authorized by the Proposed Action will have no "**effect**" on the Colorado pikeminnow, Razorback sucker, Humpback chub, and Bonytail or the three BLM sensitive species flannelmouth sucker, bluehead sucker, and roundtail chub.

General Aquatic Wildlife & Sensitive Amphibians

Aquatic organisms including fish, amphibians, and aquatic invertebrates are dependent upon water quality, quantity, and associated riparian communities to fulfil all life processes. Impacts from livestock grazing management contemplated under the Proposed Action and alternatives will be similar to those analyzed in the Riparian and Surface Water sections of this document.

Proposed Action – General Aquatic Wildlife & Sensitive Amphibians--Current livestock management was not listed as a concern or a causal factor in the degradation of aquatic wildlife habitat within the North Delta LHA unit. This may be in part due to the inaccessibility of the streams to livestock grazing, in addition to the temporal separation of grazing activates and the growth and development time of associated riparian plant communities. The proposed action presents modifications to carrying capacity (AUMs), and seasonal utilization levels, coupled with the implementation of grazing strategies which are expected to continue to maintain and may marginally improve current aquatic habitat conditions through better management in the associated uplands.

*Alternative 2 General Aquatic Wildlife & Sensitive Amphibians,*Livestock grazing was not considered to be a causal factor for riparian health observations or water quality impacts. Therefore, the removal of livestock is not expected to result in demonstrable improvements in aquatic habitat conditions.

No Action Alternative – General Aquatic Wildlife & Sensitive Amphibians,

Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment.

Finding on the Public Land Health Standard for plant and animal communities (partial, see also Vegetation; Wildlife, Terrestrial; and Invasive, Non-native Species): Current land health conditions rate aquatic species habitat in the North Delta land health unit as Standard 2 Riparian Habitat: 8.0 miles (56%) meeting, 3.5 miles (24%) meeting with problems of which 0 miles were attributed to livestock use, and 2.6 miles (18%) not meeting of which 0 miles were attributed to livestock use. Water Quality: 11.0 miles (78%) meeting, 3.0 miles (21%) meeting with problems, and 0 miles not meeting of which 0 miles were attributed to livestock use. The proposed action is expected to maintain current conditions for aquatic species.

WETLANDS & RIPARIAN ZONES (includes a finding on Standard 2)

Affected Environment:

Within the Colorado Plateau Ecoregion, six primary natural drivers for riparian and wetland systems have been identified: groundwater, channel geomorphology and soils, precipitation, temperature, stream hydrology, and animal herbivory[97]. Together these shape the composition, structure, and function of riparian ecosystems. Heavy animal herbivory in the form of livestock and native wildlife grazing can result in alteration of streamside morphology, increased sedimentation, degraded riparian vegetation through trampling and consumption, and nutrient loading. Livestock grazing practices which leave abundant stubble and groundcover on the range promote watershed cover, while practices which remove too much upland or riparian vegetation or trample and compact sensitive areas can lead to channel down cutting[98].

Impacts to stream and riparian condition will be contrasted between the different alternatives based on analysis of management activities which affect stream hydrology, stream bank soils, and riparian vegetation. Activities which degrade these features include livestock grazing practices which allow animals to congregate in riparian areas to the extent that they trample and damage stream banks and remove the riparian vegetation[98]. Intensive grazing management or development of range infrastructure can distribute livestock away from streams and wetlands, allowing the riparian area or wetland to recover[99]. Riparian conditions within the North Delta LHA can be described by the most recent determinations for Land Health Standard 2. These determinations are made from riparian Proper Functioning Condition data collected in the field, and rely on a number of hydrologic, erosion, and vegetation indicators. The indicators affected most by livestock grazing over the short and long-term will be referred to as livestock -related indicators and include riparian vegetation cover (especially for providing stream bank protection), vigor of riparian plants, and adequacy of plant roots to withstand flooding. Riparian health is determined to be meeting Standard 2 (also referred to as Proper Functioning Condition), meeting with problems (Functioning at Risk), or not meeting (Nonfunctional.) Table 1 shows, mileages across the grazing allotments for Standard 2 by determination status, with mileage broken out to reflect where there are known existing problems with the drought-related indicators.

Of six perennial streams in the North Delta LHA unit, two were meeting Land Health Standard 2 in 2012. Camp Creek met the standard in 2001 and 2012, while Alkali Creek was not evaluated in 2001. Two streams, Dirty George Creek and E. Fork Doughspoon met the standard in 2001 but were rated Meeting with problems in 2012. Kiser and Ward creeks were not rated in either year.

The circumstances leading to "meeting with problems" in the East Fork of Doughspoon Creek are:

1) channel morphology is not in balance with landscape setting;
2) riparian area not at maximum extent; and
3) the stream is not in balance with water and sediment.

The cause for the problems listed are related to water being diverted into the creek channel from other creeks and conveyed downstream to canals and farms. Livestock grazing is not considered an issue in this situation.

A similar situation exists in Dirty George Creek, with flow augmentation from diversions feeding into Dirty George, and upstream reservoirs supplying regular flows all summer, causing changes in channel morphology in an otherwise more ephemeral stream.

Two ephemeral streams were rated as not meeting Land Health Standard 2 in 2001. Oak Creek received the same rating in 2012, while Negro Creek was not evaluated in 2012. Irrigation water conveyance is identified as one cause for some of the problems in each stream, but other problems indicate watershed condition as a cause. These problems include:

1) riparian plants showing poor vigor;
2) lack of vegetation diversity in composition and structure;
3) upland watershed causing degradation, and
4) inadequate vegetation cover to protect streambanks.

Table 42. Standard 2 Determinations by allotment within N. Delta Land Health Unit.

Allotments				
	Total Miles	% Meeting	% Meeting with Problems	% Not Meeting
Deer Basin-Midway	2.1	100	0	0
Delta Pipeline	0.8	100	0	0
Dirty George	2.2	0	100	0
South Branch	0.7	100	0	0
Ward Creek-Doughspoon	8.2	52	16	32

Table 43. Standard 2 Indicators

Land Health Issues Standard 2 Riparian		
Riparian Indicator Issue	Miles	% of Stream Miles
Channel sinuosity, width:depth ratio	5.4	38
Floodplain infrequently flooded	4.1	29
Riparian zone not widening or at maximum width	3.5	24
Water and sediment not in balance with channel	3.2	22
Vegetation cover inadequate to protect streambanks	1.9	13
Riparian plants in low vigor	1.9	13
Riparian vegetation not diverse	1.9	13
Riparian species don't indicate maintenance of soil moisture	1.9	13
Channel laterally and/or vertically unstable	1.9	13

Environmental Consequences:

Impacts Common to all Alternatives This LHA unit contains very few streams in contrast to other units. Part of this is due to water rights holders manipulating stream headwaters and upper reaches on Grand Mesa to divert flow to natural channels which are then used to move the irrigation water downstream. This has resulted in some streams now being ephemeral, while others carry far more water than they would have historically. Some streams have been dry for so long they no longer support much riparian vegetation and have been removed from consideration for Standard 2. The streams which convey irrigation water largely meet Standard 2 where those flows are moderated and consistent. Where flows are extreme or subject to large and irregular fluctuations, streams are meeting with problems or not meeting Standard 2.

The augmented flows have resulted in recurring problems for some of the Standard 2 indicators that relate to the stream channel. Channel morphology is typically altered on such streams, with imbalances in water and sediment being supplied to the channel. As a result, floodplains and flood processes are not functioning as they would have historically. Only along Oak Creek have these channel problems led to riparian vegetation concerns and a not meeting Standard 2 rating.

Proposed Action –Since current livestock management was not considered a causal factor in the degradation of any riparian areas within the Land Health unit current livestock management is considered to be in balance with the riparian and stream systems present within the Land Health unit.

Livestock grazing can be a compatible use in riparian areas when managed to support the function, capability, and potential of the riparian site. Current livestock management was not listed as a concern or a causal factor in the degradation of riparian areas on any of the steams

within the grazing allotments. This may be in part due to the inaccessibility of the streams to livestock grazing, in addition to the time and duration of livestock use.

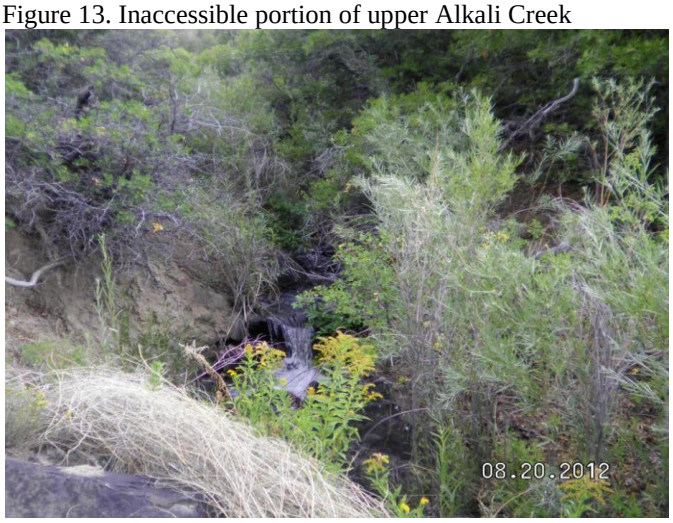
The proposed action modifications to carrying capacity (AUMs), and seasonal utilization levels, coupled with the implementation of grazing strategies will continue to maintain and may marginally improve current riparian conditions through better management in the associated uplands.

Alternative 2 (no grazing alternative) -Removal of livestock from the landscape would not improve or maintain the riparian areas more than what is currently being achieved due to contributing causal factors outside the control of BLM management.

No Action Alternative **–** Current livestock management on the Land Health unit was not a considered a causal factor in the degradation of riparian systems across the unit. This may be in part being due to the inaccessibility of the streams to livestock grazing, in addition to the time and duration of use. It is anticipated with no changes to livestock management streams would continue to either meet standards or meet with problems with the same causal factors as the last two land health determinations.

Summary of Alternatives- Because there are so many variables that contribute to riparian health and channel function related to upstream activities (irrigation) and livestock grazing was not found to be contributing to riparian degradation it is difficult to direct or expect improvement of this standard from modifications to grazing management. As a whole, these alternatives have very little influence on the standard because of other activities within the watershed/riparian system that are influencing conditions (irrigation, and private land development) which are outside BLM control. There are no anticipated reductions in direct or indirect impacts across any of the alternatives**.**

Figure 13. Inaccessible portion of upper Alkali Creek



Finding on the Public Land Health Standard for riparian systems: Current land health conditions determine riparian vegetation in the North Delta land health unit is meeting 100% on 5 streams out of 8 streams, meeting with problems on 2 streams, and not meeting on one stream. Current livestock management was not noted as contributing to the meeting with problems on 2 streams or not meeting status of one stream. The proposed action will not have any direct or indirect impacts on riparian vegetation for Standard 2.

WATER -- SURFACE (includes a finding on Standard 5)

Affected Environment:

The scope of the analysis for direct and indirect effects includes the watersheds in the North Delta LHA area extending from the top of Grand Mesa to their termination at the Gunnison River. These 9 HUC 6 watersheds total about 181,272 acres.

Selenium

Selenium is a naturally occurring soluble trace metal found in the marine sediments of the Mancos Shale. Selenium can be easily mobilized by applying irrigation water to soils derived from Mancos Shale or from surface disturbing activities on Mancos Shale, and delivered to nearby waterways by irrigation return flow, groundwater, or overland flow. Once in the waterways, selenium can move through the aquatic environment, bio-accumulate in organisms and potentially reach toxic levels[100].

In 1997, the Colorado State Water Control Commission revised the chronic aquatic-life criterion for dissolved selenium from 17 µg/L to 4.6 µg/L. The Selenium Task Force was created soon after to address selenium issues. The group is comprised of private, local, state, and federal agencies including the BLM.

As required by the Clean Water Act and the 303(d) listing, the Colorado Water Quality Control Division released the TMDL in 2009 for the Gunnison River and tributaries and the Uncompahgre River and tributaries. This project is within the contributing area covered by the TMDL. Remediation strategies are implemented in part by the Selenium Task Force as well as

the Selenium Management Program administered by the Bureau of Reclamation.

In 2009 the Fish and Wildlife Service issued a Programmatic Biological Opinion (PBO) under the Endangered Species Act to address the recovery of endangered fish species. The PBO addresses the Bureau of Reclamation's Aspinall Unit operations as well as all other public and private uses in the Gunnison Basin. The primary requirements of the PBO are the reoperation of the Aspinall Unit and the implementation of a Selenium Management Program. The BLM is a signatory to a Memorandum of Understanding with the Bureau of Reclamation, State of Colorado, and local irrigation companies, to assist in the development and implementation of a long-range plan. In the MOU, the BLM agreed to, "Evaluate options to conform to a goal of no net new selenium loading from land exchanges, sales, and other actions involving public lands."

Salinity

Salts are another naturally occurring component of the sedimentary formations in the three Land Health Areas and are easily mobilized. The soluble mineral content of the Mancos Shale can be as high as 20% but is typically more like 6%, and the major mineral is typically gypsum. Salts are mobilized by both surface water and groundwater. Mean annual salinity load at the Colorado/Utah state line in the Colorado River is 2.89 million tons. In a study reviewing the salinity trends in the Colorado from 1986-2003, the contribution from the Gunnison basin was found to be 38% or a little over 1 million tons annually[101]. The Colorado River Basin Salinity Control Act passed in 1974 and amended in 1984, directs the BLM to minimize salt contributions to the Colorado River system from BLM administered lands.

Standards and Classifications

The impaired surface waters table below shows the surface waters in the area that are on Colorado's impaired waters, 303(d) or Monitoring and Evaluation list (CDPHE, Water Quality Control Commission, 5 CCR 1002-93).

Table 44 Impaired Surface Waters in the Crossing EA Area

Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COGULG02 Gunnison River, Uncompahgre River to Colorado River	all	Sediment	*E. coli*	H
COGULG07 Surface, Ward, Tongue, Youngs, and Kiser Creeks not on USFS land	Tongue Creek		Se, Fe(Trec)	M
COGULG07 Surface, Ward, Tongue, Youngs, and Kiser Creeks not on USFS land	Ward Creek	Se		
COGULG07 Surface, Ward, Tongue,	Surface Creek	Pb		

Youngs, and Kiser Creeks not on USFS land				
COGULG04b All lakes and reservoirs tributary to the Gunnison River and not on national forest lands from the outlet of Crystal Reservoir to the Colorado River	Jatz Bottomlands	Se		
COGULG04a Tributaries to Gunnison River, Crystal Reservoir to Colorado River	Wells Gulch	pH		

The non-point source pollutants from various land uses on public and private property likely contribute to the E. coli, sediment, and selenium listings. E. coli sources include human, wildlife, and livestock waste. Once E.coli enter the aquatic environment they can persist for long periods of time. Sediment in streams may present a favorable environment for bacteria attachment to soil particles. Very little is known about the extent and mechanisms of this attachment[102].

Results of 2012 Water quality and Macroinvertebrate sampling
The only water quality parameter of concern on several of the creeks was fecal coliform. The State actually uses E. coli as the water quality standard but fecal coliform can be used as an indicator of bacterial levels in the stream. In both BeeBee Gulch and Oak Creek fecal coliform levels were near the water quality standard.

All three sites met attainment for aquatic life use using the Colorado Department of Public Health and Environment Multimetric Index (MMI), but Oak Creek was rated in poor condition, indicating impairment of some kind. The total lack of entire functional groups of macroinvertebrates and a lack of water quality exceedances indicate a lack of flows may be impairing the macroinvertebrate community rather than a pollutant.

Alkali creek had the best overall macroinvertebrate community using the HBI and EPT metrics. Beebee Gulch was also in good condition while Oak Creek scored low in both HBI and EPT with a poor overall macroinvertebrate community. Since there were no concerns with water quality at any of the sites the macroinvertebrates in these streams seem to be most impacted by the existence of stream flows.

This sampling resulted in 11.1 miles of streams or 78% meeting land health standards and 3.0 miles meeting with problems or 21%. The low number of streams sampled is primarily due to the manipulated nature of water in the land health unit. Water is plentiful on top of Grand Mesa where winter storms drop a significant amount of snow. Water is intercepted and stored in numerous lakes across the top of the mesa and is distributed out through a network of irrigation ditches and natural drainages to private property on the flanks and toe of the mesa. Several ephemeral channels that might naturally only see flows several times a year have been channelized and used for transmitting irrigation water. This augmented flow can make an otherwise dry channel flow for 4-5 months during the irrigation season. These flows can produce

increased riparian vegetation as well as a macroinvetebrate community. However, when irrigation flows run out, the stream slowly dries out as the water that was stored in the floodplain and banks is wrung out like a sponge.

Environmental Consequences:

Impacts Common to all Alternatives--Unirrigated rangeland underlain by Mancos Shale in the North Delta LHA contributes to several indirect effects including; increased salinity and selenium concentrations in the water column, sedimentation, and E coli contamination. These indirect effects are naturally occurring through erosional processes. However, existing disturbance from roads, rights-of-ways, and grazing increases soil mobilization during rain events delivering more contaminants to the stream channel. Recent studies in the area analyzed the contributions of salinity and selenium from the rangeland sites like those found in the North Delta LHA and are summarized below. The indirect impacts of sediment and E. coli are also discussed.

Increased salinity in the Gunnison River impacts downstream water uses such as drinking water use and the irrigation of crops. In a study conducted by the USGS estimating the contributions to the annual salinity load in the Gunnison River, they determined the low elevation unirrigated rangeland sites underlain by Mancos Shale contribute 13-26 percent of the salinity load[103] . The remaining portion of salinity load is contributed by irrigation return flows, municipal inputs and return flows from deep percolating groundwater.

Selenium is present in highly soluble sodium salts and gypsum on unirrigated Mancos Shale rangelands in the North Delta LHA area. Laboratory experiments with soils collected in the area indicate selenium is released most rapidly when water is applied to previously non-irrigated soils[104]. Since rangelands are not irrigated, the selenium present in soils is only mobilized during large rain events when overland flow mobilizes soils. These events deliver large volumes of water, but for short periods of time. The total load of selenium contributed to the Gunnison River during these events is actually small compared to the ongoing contributions from other sources. A recent study conducted in the Smith Fork Creek region south of the LHA area with similar soils and underlying geology found three natural sub-basins with grazing had little to no selenium loads[105].

Further evidence that selenium from rangelands is a minimal source contributing to the Gunnison River is the trend of selenium loads in Gunnison River. Long term selenium trends in the Gunnison River have dropped 28.6 percent since 1986[106]. Much work has been done to improve irrigation practices and lining canals and ditches in the contributing areas of the Gunnison and Uncompahgre basins. Whether the decline in trend is due to the agricultural improvements or due to the reduction of selenium available to be flushed from irrigated fields over time is unknown. During the period of declining trend, rangeland health conditions haven't changed as shown in the two recent land health surveys for North Delta. This likely indicates that the selenium load contributed from rangeland has little influence on the selenium loads in the Gunnison River.

Sediment is on the State of Colorado's Monitoring and Evaluation list for the reach of the Gunnison River where the LHA area drains. Increased sediment can affect downstream water

uses like drinking water as well as fish habitat. Fish habitat affected by sediment for endangered fishes in rivers like the Gunnison includes both gravelbed reaches (spawning-habitat and food-source locations), backwater areas, and overbank habitat (juvenile habitat) formed along the banks of sand-bed reaches[107]. Recent sediment sampling conducted by the USGS found multiple cross sections within two reaches of the Gunnison River downstream from the Aspinall Storage Unit with ineffectual mobilization of bed material. The Gunnison River also has no evidence of reaching equilibrium conditions in suspended sediment concentrations. This indicates that larger time scales may be needed since completion of the Aspinall Unit to reach stable conditions within this system or that the observed trends are in response to more continuous anthropogenic changes or climatic effects within the basin[108].

E. coli is on the State of Colorado's 303(d) list for the Gunnison River from the Uncompahgre River to the confluence with the Colorado River. E. coli is used by the State as an indicator of the presence of pathogenic organisms that can cause illness through recreational contact or drinking contaminated waters. Some of the manure-borne pathogens of concern in addition to E. coli include: Campylobacter, Listeria monocytogenes, Salmonella, Yersinia enterocolitica, protozoa Cryptosporidium parvum, and Giardia. The infectious doses of bacterial pathogens can vary widely. The infectious dose for enterohemorragic E. coli is 10 cells, 500 cells for Campylobacter, 105 for Salmonella, and as high as 108 for some strains of pathogenic E. coli. The infectious doses are smaller for protozoa: less than 10 organisms for the C. parvum and 10–25 for Giardia[109].

Proposed Action – The Alkali Flats allotment contains two major drainages. Point creek is an ephemeral drainage 3.2 miles in length, but is not rated for land health due to the lack of water present. The allotment contains short reaches of Alkali Creek in the southeast corner that was also not rated for land heath standards due to the short length. The Alkali watershed contains high levels of bare soil and low cryptogam cover which is estimated to recover in the range of 14-50 years. This is due to the low precipitation, fine grained soils and routine disturbance to the soils[110]. In a study conducted by the USGS, the estimated annual salinity load contributed to the Gunnison River by the Alkali Creek watershed is 54 tons/year[103]. Selenium loads measured in Red Canyon (at Poison Spring Gulch), a nearby tributary to the Gunnison River with similar geology and uplands dominated by rangeland, was less than 0.1 pounds/year[111]. The proposed action reduces the active selenium load, based on 10 year actual use AUMs by 30%, as well as utilization levels, and implements delineated use areas with periodic rest. Because of the long term recovery of watershed health compared to the 10 year scope of this grazing permit, very little direct reductions in salinity and selenium contributions to the Gunnison River would be expected. Direct salinity loading impacts would continue at approximately 54 tons/year, with the proposed action, which is similar to the no action alternative. The direct selenium load impacts would continue to be approximately 0.1 pound/year in both the proposed action and the no action alternative.

The Delta Pipeline and Deer Basin-Midway allotments share a border formed by 2.9 miles of Alkali Creek. The entire 2.9 miles are in the upper reaches of the Alkali Creek watershed and were found to be meeting land health standards. While lower portions of the allotment have low levels of cryptogam cover and low plant basal cover, the upper reaches of the allotments have better cover. Channel incision and a lack of vegetation and roots to withstand flooding were

noted as problems. The reduction of the average 10 year actual use AUMs by 30% and utilization reductions of 15% will result in direct reductions to streamside vegetation. However, due to the large contributing area of the lower portions of the allotments, contributions of salinity and selenium would continue at existing rates as described in the Alkali Flats allotment in both the proposed action and the no action alternative.

The Dirty George allotment contains 1.5 miles of Dirty George Creek. Dirty George Creek is heavily augmented by irrigation flows from storage reservoirs on Grand Mesa. The resulting riparian vegetation has reached its maximum extent while stabilizing the banks. The proposed action does not change the Active AUMs or utilization levels. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative.

The Petrie Mesa allotment contains numerous ephemeral drainages but no perennial drainages. Upland soil conditions are mostly meeting, with 766 acres meeting with problems. Vegetation is entirely meeting with problems, and some areas of not meeting. The proposed action reduces the average 10 year actual use AUMs by 30%, as well as utilization levels from 50% to 35%, and implements delineated use areas and a new grazing strategy. Due to the recovery time of both biological soil crust and perennial plant species, no direct reductions in contributions of salinity and selenium would be expected in both the proposed action and the no action alternative.

The Point Creek allotment contains 1.2 miles of Alkali Creek, but this reach no longer carries water. The entire flow is diverted into an irrigation ditch and carried to adjacent private property. Soil land health standards are meeting with static trends, however standard 3 is mostly not meeting due to low plant basal cover, exotic invasive species and noxious weeds. Reductions in the average 10 year actual use AUMs by 30% and utilization reductions, will not result in direct and indirect reductions in salinity and selenium contributions to the Gunnison River, due to the limited extent of BLM land in the allotment. Existing irrigation on nearby private lands and existing roads and rights-of-way will continue to contribute salinity, selenium, sediment and E. coli to alkali creek at rates in the proposed action and similar to the no action.

The South Branch allotment contains 0.8 miles of Camp Creek, a perennial stream augmented with irrigation flows from the top of Grand Mesa. With the higher elevation of this allotment, more annual precipitation results in a variety of upland and riparian vegetation. The proposed action does not change the active AUMs or utilization levels. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative.

The Ward Creek-Doughspoon allotment contains 2.8 miles of BeeBee Creek, 2.4 miles of Doughspoon Creek and 1.9 miles of Oak Creek. All of these drainages are augmented with irrigation water coming from the top of the mesa. Doughspoon and BeeBeek Creek both meet land health standard 5, while Oak Creek meets with problems. Problems with Oak Creek were deep incision, vertical instability, lack of riparian diversity, and irrigation tail water. The proposed action does not adjust the Active AUMs but does reduce the utilization levels from 50% to 35%. These actions are not expected to result in direct reductions to the indicators or the problems cited, since the cause is likely due to using the channel to convey irrigation water for over a century. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative.

The Wells Gulch Allotment contains several ephemeral drainages, the largest being Wells Gulch. Unlike some of the other large drainages in the LHA area, Wells Gulch is not used to convey irrigation water, and therefore is largely in a natural condition. Upland conditions for soils and vegetation are mostly meeting land health standards, although vegetation is meeting with problems in some areas. The proposed action does change the active AUMs to reflect what is suggested in the ecological site description(s) in addition to reducing utilization levels from 50% to 35%. There are no anticipated reductions in direct or indirect impacts compared to the no action alternative.

Alternative 2 (no grazing)-Removing grazing from the North Delta land health area is unlikely to reduce the direct and indirect impacts from grazing in the lifespan of the 10 year grazing permit. Recent studies indicate the contribution of salinity and selenium to the Gunnison River from rangelands is small compared to other land uses in the region. Reductions in E coli and sediment would be expected as fecal matter breaks down over time and new contributions from livestock are removed. Sediment would be reduced as upland biological soil crust and perennial vegetation increases. Recovery would be expected to take 25-50 years, and full recovery is unlikely, due to the presence of invasive species. Other disturbances from rights-of-ways, OHV and wildlife, would continue to impact water quality.

No Action Alternative - Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Direct and indirect impacts would be expected to continue at similar levels.

Finding on the Public Land Health Standard for water quality--Current land health conditions rate water quality in the North Delta land health unit as 11.1 miles meeting, 3.0 miles meeting with problems, and 0 miles not meeting. The proposed action is unlikely to reduce direct and indirect impacts to water quality over the life of the 10 year permit renewal.

SOCIO-ECONOMICS

Affected Environment

The majority of the project area is located in Montrose and Delta Counties on the western slope of Colorado. In 2013, Delta County had a population of 30,483 and Montrose County a population of 40,713. The per capita income is $34,681 in Delta County and $32,750 in Montrose County. Farm and ranch employment accounts for 9% or 1,387 of the 14,971 jobs in Delta County. In Montrose County farm employment accounts for 5% or 1,190 of the 22,045 jobs[112].

Livestock grazing is a substantial part of Colorado's $40 billion agricultural industry as the market value of the sale of cattle and calves accounted for approximately $4.4 billion in 2012. Nationally, Colorado ranked fifth in sales of the cattle commodity group, eleventh for cattle inventory, and third for sheep and lamb inventory[113].

As previously noted, in this Environmental Assessment, studies have found that approximately 24% of the private land in Delta, Gunnison, Mesa, Montrose, Ouray, and San Miguel counties is associated with permitted livestock grazing on both BLM and USFS managed lands[2]. This

characteristic of regional private land-use and the economics of ranching highlight the critical role that federal AUMs have on an individual rancher's decisions on herd size, and management operations. As a change in federal AUMs will alter the decision of a rancher in respect to herd size, grazing rotation, and scheduling, these decisions may impact land-use up to or more than 24% of private land associated with grazing on federal lands in the six-county region.

Delta and Montrose Counties had cattle and calf inventories of 33,208 and 56,083 and sheep and lamb inventories of 13,611 and 15,433 respectively, in 2012[114]. Current grazing fees on public land are $1.69 per AUM, compared to $10.57/AUM on Colorado State Trust Lands in the Southwestern Colorado, and $17.50/AUM on private land[115,116,] (BLM 2015, Colorado 2014, and USDA 2014). Within the project area that BLM administers, there are 10 grazing permits authorizing livestock grazing on 9 allotments.

Fees from permits (Section 3 of the Taylor Grazing Act) issued for grazing, within a grazing district, on public lands are distributed as follows:

- 50% - Range Improvement Fund
- 12.5% - State of Colorado (distributed according to state law)
- 37.5% - U.S. Treasury

Environmental Consequences

Impacts Common to all Alternatives -There are socioeconomic consequences due to competing habitat and land-use conflicts within the planning area. Specifically, portions of the planning area contain Gunnison Sage-grouse and Rocky Mountain bighorn sheep habitat, as competition between livestock and wildlife grazing may contribute to vegetation damage on adjacent and nearby private lands. These impacts can be attributed to the scarcity of suitable land for both grazing by livestock and wildlife, and of limited habitat for sensitive species that are compounded by drought and land health issues.

Environmental Justice - Executive Order 12,898 requires federal agencies to assess projects to "identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." There are no environmental justice communities within the study area. The areas involved in the project are rural in nature, small communities; with sparsely populated subdivisions exist within existing distances of the proposed activity.

Proposed Action - Socioeconomic consequences of the proposed action include possible changes in the timing, scale, and revenue generated through ranching operations, due to the changes regarding permits and AUMs. An input-output analysis model (IO model), of the regional economy, was constructed to examine the impact of a loss of $1000.00 of economic activity in the cattle ranching and farming sector. This IO model, with a $1000.00 reduction of economic activity in cattle ranching and farming, assesses the impacts of a reduction of AUMs on the regional economy. The $1000.00 reduction represents how a change would impact the regional economy, and was selected as the uncertainty of the costs of ranching operations. Further, the fluctuation of cattle market prices, make it impractical to accurately estimate the costs of a

reduction of AUMs. Accordingly, the $1000.00 impact provides the reader a benchmark to measure the total economic consequences of every $1000.00 reduction of direct economic activity within the cattle ranching and farming sector. The results of the IO model find a $405.00 reduction of indirect economic activity and $67.00 reduction in economic activity. Overall, a $1000.00 reduction of economic activity resulting from a reduction of AUMs across the study area results in a $1,472.00 reduction of total economic activity within the regional economy. The sectors most affected include cattle ranching and farming, support activities for agriculture, real estate, financial services, healthcare, and retail and wholesale trade. Further, using a similar benchmark to measure job losses, the regional economy loses 1.7 jobs for every $100,000.00 reduction of cattle ranching and farming direct economic activity[117].

Alternative 1 – Social consequences include changes in the ranching lifestyle resulting from the loss of agricultural revenue and jobs due to permits not being renewed. Economic consequences would include increased ranch operation costs or declines in regional cattle production both of which could result in the sale of private ranch lands.

No Action Alternative (current management) – Continuation of grazing under current management would result in no short-run changes to the socioeconomics of the study area. However, long-run consequences could result in the decline of economic activity or feasibility of certain allotments due to continued declining rangeland health and productivity.

RANGE MANAGEMENT

Affected Environment

The North Delta Land Health Unit saw unrestricted and unregulated domestic grazing from the time of settlement until the passing of the Taylor Grazing Act in 1934 as amended 1936, 1938, 1939, 1942, 1947, 1948, 1954 and 1976. The Taylor Grazing Act of 1934, sought to "stop injury to the public grazing lands by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; and to stabilize the livestock industry dependent upon the public range" through lease of the public domain to stock raisers. This orderly use of the range continued until the onset of World War II when livestock trespasses increased and harvesting of vegetation went above allowable levels. In 1946 the Bureau of Land Management was created and there were many initiatives dealing with grazing, from the development of 10 year grazing leases, to AUM adjudication. However, the monumental change came in the 1960 with the Bureaus multiple use mandates. The BLM range program developed Allotment Management Plans (AMPs) which set forage goals for wildlife, livestock, soil stability, and recreation. In addition the passing of Federal Land Management Policy Act (FLMPA) in 1976 continued Congress's support of the planning process by establishing policy to retain public lands, inventory and identify land resources, and provide multiple use and sustained yield management of public land and resources through planning (also see the vegetation section for additional historical information).

The latest land health determinations (2012), across the project landscape for upland standard 1 Soil, 3 Vegetation, and 4 Wildlife/TES are: 45% are meeting, 34% are meeting with problems, and 14% are not meeting. In addition, stream standard 2 Riparian and 5 Water quality, within the project landscape, is 78% meeting, 19% meeting with problems, and 3% not meeting.

Assumptions:
In each allotment the majority of adjustments to livestock management will be driven by deficiencies analyzed within the largest ecological site.

Environmental Consequences

Alkali Flats # 14017
In the prior permit renewal, this allotment consisted of approximately 12,433 acres, of which 100% was public land with an active grazing preference of 1,387 AUMs. During this permit renewal process, 3,464 acres and 386 AUMs were removed from the allotment to create the Huff Allotment #04294 located within the Dominguez Escalante National Conservation Area. The change in acres brought the allotment to 8,969 acres with an active grazing preference of 1,001 AUMs with no change in the percent public land. The active grazing preference will be discussed in the following paragraphs. In the 1987 RMP, the allotment was classified an "I" category allotment which calls for most intensive management, with the objective of improving existing resource conditions. This category will not change during this permit renewal process.

The stony salt desert ecological site has the greatest acres within the allotment, and the majority of adjustments in management, will be driven by deficiencies in this ecological site. Current grazing management was noted as contributing to Standard 1 Soil, Standard 3 Vegetation, and Standard 4 T&E species, concerns on the allotment. Current estimates of forage produced on the allotment, with average precipitation, does not support the active 1,001 AUMs. Currently the carrying capacity on the allotment is 9acres/AUM. This acre/AUM allocation is considered low for salt desert shrub communities in poor condition. This allotment would be considered in poor condition when compared to the associated ecological sites comprised within the allotment, the recent LHA finding, and current livestock management, contributing to 78% of the allotment, not meeting or meeting with problems with a downward trend. With this acknowledged and the majority of the allotment struggling to meet land health standards, the carrying capacity will go from 9 ac/AUM to 18 ac/AUM, which will change the active AUM preference on the permit from 1,001 to 493. In addition, utilization will go from 50% to 35%, except in areas of high concentration (fencelines, cattleguards, water developments, sheep bedgrounds, and roadsides where utilization is expected to be higher)[118]. AUMs will be decreased according to CFR § 4110.3-3 (a) which states, "After consultation, cooperation and coordination with the affected permittee or lessee, and the state having lands or responsibility for managing resources within the area, the authorized officer will implement changes in active use through a documented agreement or by a decision." The authorized officer will implement changes in AUMs over a 3 year period. In addition, the BLM will work with the permittee to set up use areas within the allotment which will allow for more intense grazing management and periodic rest to be implemented within areas of the allotment.

Table 45 Proposed Permit Alkali Flats

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Alkali Flats #14017	1200/Sheep	12/1	2/28	100	Active	493

Dates are opened up on the permit to allow for rotations between allotments, however AUMs associated with the permit will not be increased.

Deer Basin/Midway #14019

The allotment consists of approximately 12,438 acres of which 96 % is public land with an active grazing preference of 900 AUMs. In the 1987 RMP, the allotment was classified an "I" category allotment which calls for most intensive management, with the objective of improving existing resource conditions. This category will not change during this permit renewal process.

Current grazing management was noted as contributing to, Standard 1 Soil, Standard 3 Vegetation, and Standard 4 T&E species, concerns on a large portion of the allotment, especially the lower elevation Midway pasture. Trend data on the allotment suggests the allotment is in static trend, for the Deer Basin pasture, and downward for the Midway pasture. This allotment, most notably the lower elevation portion, would be considered in poor condition, when compared to the associated ecological sites comprised within the allotment, and the current LHA finding of 99% of the allotment not meeting or meeting with problems with a downward trend. Currently the carrying capacity on the allotment is 14ac/AUM, and the current estimate of forage produced on the allotment with average precipitation, does not support the active 900 AUMs. With this acknowledged, and livestock management contributing to more than a third (40%) of the allotment struggling to meet land health standards, the carrying capacity will go from 14ac/AUM to 47 ac/AUM, which will change the active AUM preference from 990 to 249. In addition, utilization will go from 50% to 35%, except in areas of high concentration (i.e. fencelines, cattleguards, water developments, sheep bedgrounds, and roadsides) where utilization is expected to be higher. Most adjustments in AUMs will be in the lower parcel of the allotment, since it is not meeting LHS and is in a downward trend. AUMs will be decreased according to CFR § 4110.3-3 (a) which states "After consultation, cooperation and coordination with the affected permittee or lessee, and the state having lands or responsibility for managing resources within the area, the authorized officer will implement changes in active use through a documented agreement or by a decision." The authorized officer will implement changes in AUMs over a 3 year period. A portion of the AUMs reduced will be permanently removed from the allotment, and a portion will be placed into "suspended non-use" and could be reallocated depending upon allotment condition in the future. In addition, the BLM will work with the permittee to set up use areas within the allotment, which will allow for more intense grazing management and periodic rest to be implemented within use areas in the allotment.

Table 46 Proposed Permit Deer Basin/Midway

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Deer Basin/Midway #14019	1576/Sheep	12/1	02/28	96	Active	249

Dates are opened up on the permit to allow for rotations between allotments, however AUMs associated with the permit will not be increased.

Delta Pipeline # 03277

This allotment consists of approximately 6,029 acres of which 100 percent is public land with an active grazing preference of 563 AUMs. In the 1987 RMP, this allotment was a pasture within the Alkali Flats allotment which was classified an "I" category allotment which calls for the most intensive management, with the objective of maintaining existing resource conditions. This category will be carried through to this allotment and will not change during this permit renewal process.

Currently, the carrying capacity on the allotment is 11ac/AUM, and the current estimate of forage produced on the allotment with average precipitation, does not support the active 563 AUMs. With this acknowledged and livestock management contributing to almost half (47%) of the allotment struggling to meet land health standards, the carrying capacity will go from 11ac/AUM to 24 ac/AUM, which will change the active AUM preference from 563 to 252. In addition, utilization will go from 50% to 35%, except in areas of high concentration (i.e. fencelines, cattleguards, water developments, sheep bedgrounds, and roadsides) where utilization is expected to be higher.

Table 47 Proposed Permit Delta Pipeline

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Delta Pipeline #03277	1200/Sheep	12/1	02/28	100	Active	252

Dates are opened up on the permit to allow for rotations between allotments, however AUMs associated with the permit will not be increased.

Dirty George #14023
The allotment consists of approximately 1,389 acres of which 100 percent is public land with an active grazing preference of 133 AUMs. In the 1987 RMP, the allotment was classified an "M" category allotment, which calls for less intensive management, with the objective of maintaining existing resource conditions. This category will not change during this permit renewal process.

The Land Health Assessment done in 2012 for this allotment indicates it is meeting LHS for Standard 3 Vegetation. The largest ecological site in the allotment is Deep Clay Loam with 779 acres, as the other ecological site is Mountain Pinyon (NRCS draft, 1995) with 580 acres. These combined acres are what was evaluated in the allotment.

Current grazing management was not noted as a concern on the allotment. Current estimates of forage produced on the allotment with average precipitation does support the active 133 AUMs. Currently, the carrying capacity on the allotment is 11ac/AUM. This allocation is considered sufficient for this allotment and the higher location on the landscape.

Table 48 Proposed Permit Dirty George

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Dirty George #14023	200/Cattle	10/15	10/20	100	Active	39
	205/Cattle	06/02	06/15	100	Active	94

* Dates are opened up on the permit to allow for rotations between allotments however, AUMs associated with the permit will not be increased.

Petrie Mesa #14022
The allotment consists of approximately 2,825 acres of which 100 percent is public land with an active grazing preference of 104 AUMs. In the 1987 RMP the allotment was classified an "M" category allotment which calls for less intensive management , with the objective of maintaining existing resource conditions. This category will change during this permit renewal process to an "I" category which is most intensive management, with the objective of improving existing resource conditions. This change is in response to threated and endangered species and associated habitat.

The Land Health Assessment done in 2012 for this allotment indicates it is not meeting (27%) and meeting with problems (71%) for approximately 98% of the allotment. Of this, current livestock management was found to be one of the significant causal factors on 27% of the allotment. The largest land mass on the allotment is 2006 acres of adobe badlands. The other ecological site is stony salt desert with 767 acres, and these combined acres are what were evaluated in the allotment.

Current grazing management was noted as contributing to, Standard 3 Vegetation, and Standard 4 T&E species, concerns on the allotment. Current estimates of forage produced on the allotment with average precipitation should support the active 104 AUMs when proper livestock distribution is achieved. Currently, the carrying capacity on the allotment is 27ac/AUM. This allocation should be sufficient for the type vegetation communities on the allotment when compared to the ecological sites comprised within the allotment. However, with this

acknowledged, 27% of the allotment not meeting Standard 3 Vegetation, with livestock management contributing, and actual use across a 10 yr period at 73 AUMs management will need to be adjusted, to move the allotment towards meeting LHS. Active AUMs will go from 104 to 51 and utilization will go from 50% to 35%, except in areas of high concentration (i.e. fencelines, cattleguards, water developments, sheep bedgrounds, and roadsides) where utilization is expected to be higher. In addition, the BLM will work with the permittee to set up use areas within the allotment that will allow for more intense grazing management and periodic rest to be implemented within identified use areas.

Table 49 Proposed Permit Petrie Mesa

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Petrie Mesa #14022	1200/sheep	12/1	2/28	100	Active	51

Dates are opened up on the permit to allow for rotations between allotments however, AUMs associated with the permit will not be increased.

Point Creek# 14021

The allotment consists of approximately 4,750 acres of which 1,614 acres are public land that equates to 24% public land allotment with an active grazing preference of 101 AUMs. In the 1987 RMP, the allotment was classified a "C" category allotment which calls for less intensive management with the objective of maintaining existing resource conditions. This category will change during this permit renewal process to an "I" category that calls for the most intensive management, with the objective of improving existing resource conditions. This change is in response to threated and endangered species and associated habitat.

The Land Health Assessment done in 2012 for this allotment indicates it is not meeting for approximately 63% of the public land within the allotment, with livestock management noted as one of the significant causal factors. Concerns recorded were an overall increase in exotics, decrease in shrubs, and an overall decrease in natives in relation to the Ecological Site Descriptions and the last LHA completed. The largest ecological site on the allotment is the stony salt desert, 994 acres, and is the second largest site is in the adobe badlands, with 610 acres. Other ecological sites on the allotment include: clayey salt desert, salt flats, and sandy salt desert.

Current grazing management was noted as contributing to Standard 3 Vegetation and Standard 4 T&E species, concerns on the allotment. The current estimate of forage produced on the allotment with average precipitation does not support the active 102 AUMs. Currently, the carrying capacity on the allotment is 16ac/AUM which is not sufficient for the compromised vegetation communities on the allotment. With this acknowledged and 62% of the allotment not meeting Standard 3 Vegetation, the allotment displaying a downward trend with livestock management contributing, management on the allotment will need to be adjusted to move the allotment towards meeting LHS. Change in management will include, reducing AUM allocation on the allotment to 68 AUMs, that will allow for 24 ac/AUM, and modifying utilization guidelines on the allotment from 50% to 35%, except in areas of high concentration (i.e. fence

lines, cattle guards, water developments, sheep bedgrounds, and roadsides) where utilization is expected to be higher. In addition, the BLM will work with the permittee to set up use areas within the allotment, which will allow for more intense grazing management and periodic rest, to be implemented within identified use areas. Even with the proposed changes in livestock management, the allotment may need invasive species treated to reduce the competition between natives and weedy species, improve vigor on existing shrubs, and allow for cool season grasses to reestablish.

Table 50 Proposed Permit Point Creek

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Point Creek #14021	1000/sheep	5/1	5/31	24	Active	20
	1000/sheep	11/16	2/28	24	Active	48
	Or 1000/sheep	11/16	2/28	24	Active	68

Dates are opened up on the permit to allow for rotations between allotments however, AUMs associated with the permit will not be increased.

South Branch # 14004

The Land Health Assessment done in 2012 for this allotment indicates it is meeting for the entire allotment. The allotment consists of approximately 1,049 acres of which 825 acres are public land. This equates to 78% public land allotment with an active grazing preference of 101 AUMs. This is a change from the last LHA when the public land percentage was 65%. The change in public land is due to GIS mapping of correct allotment boundaries. In the 1987 RMP the allotment was classified an "M" category allotment that calls for less intensive management, with the objective of maintaining existing resource conditions. This category will not change. The largest ecological site on the allotment is Mountain Pinyon (draft NRCS1995), 403 acres, the second largest site is Deep Clay Loam with 374 acres.

Current grazing management was not noted as contributing to Standard 3 Vegetation, and Standard 4 T&E species, concerns on the allotment. Current estimates of forage produced on the allotment with average precipitation should support the active 101 AUMs. Currently, the carrying capacity on the allotment is 10ac/AUM. This AUM allocation has proven to be sufficient, through past studies and LHA, for the location on the landscape, elevation, and vegetation communities on this allotment.

Table 51 Proposed Permit South Branch

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
South Branch #14004	111/cattle	06/04	06/30	78%	Active	65
	111/cattle	10/15	10/29	78%	Active	36

*the grazing period is opened up to allow for flexibility, the AUMs available for use will remain unchanged.

Ward Creek/Dough Spoon # 14025
This allotment is a common allotment which consists of approximately 27,943 acres of which 17,190 acres are public land. This equates to 63-100% public land allotment, depending upon permittee preference, with a total active grazing preference of 443AUMs. In the 1987 RMP, the allotment was classified an "I" category allotment that calls for most intensive management, with the objective of improving existing resource conditions. This category will not change. The largest ecological site on the allotment is clayey salt desert with 9,622 acres, other ecological sites on the allotment include: shallow and sandy loam pinyon juniper (3,507 ac), stony salt desert (2,746 ac) and Deep Clay Loam (470 ac).

Overall, current grazing management was not considered a significant causal factor in the health of the allotment for Standard 3 Vegetation and Standard 4 T&E species. Current estimates of forage produced on the allotment with average precipitation supports the active 445 AUMs. The carrying capacity on the allotment is 69.3ac/AUM, and this AUM allocation is sufficient for the location on the landscape, elevation, and vegetation communities on this allotment.

Table 52 Proposed Permit Ward Creek/Dough Spoon

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Ward Creek/Dough Spoon #14025	25/cattle	10/16	11/01	63	Active	9
	226/cattle	5/27	6/15	64	Active	95
	226/cattle	10/16	10/18	64	Active	14
	26/cattle	10/16	10/27	100	Active	10
	58/cattle	05/02	06/16	100	Active	88
	21/cattle	05/02	06/16	100	Active	32
	11/cattle	10/16	10/27	100	Active	4
	90/cattle	10/16	11/2	100	Active	53
	142/cattle	5/17	6/15	100	Active	140

*the grazing period is opened up to allow for flexibility, the AUMs available for use will remain unchanged.

Wells Gulch #14016
In the subsequent permit renewal, this allotment consisted of approximately 16,879 acres, of which 100% was public land with an active grazing preference of 2,366 AUMs. During this permit renewal process, 6,536 acres and 933 AUMs were removed from the allotment to create the Dominguez Rims allotment #04293, located within the Dominguez Escalante National Conservation Area. The change in acres brought the allotment to 10,343 acres with an active grazing preference of 1,433 AUMs and no change in the percent public land. The active grazing preference (AUMs) will be discussed in the following paragraphs. In the 1987 RMP the allotment was classified an "I" category allotment that calls for the most intensive management, with the objective of improving existing resource conditions. This category will not change.

The Land Health Assessment done in 2012 for this allotment indicates it is meeting land heath standards in 29% of the allotment, and meeting with problems for 71% of the allotment. There were no acres within the allotment not meeting standards. Of the 71% meeting with problems,

current livestock management was only one of the causal factors and not found to be the significant causal factor for any one area meeting with problems. Concerns noted were low occurrences of perennial shrubs, fire, rights of ways, and low numbers of perennial cool season grasses and forbs in some areas. In addition, an increase in noxious and invasive weeds, mainly halogeton, were noted as having increased on the allotment and were contributing greatly to areas meeting with problems.

Current grazing management was not noted as being a significant causal factor for acres meeting with problems for Standard 3 Vegetation and Standard 4 T&E species concern on the allotment. The 1,433current active AUMs are higher than suggested in the ecological site descriptions by 261 AUMs. With this acknowledged and current estimates of forage produced on the allotment with average precipitation, the allotment will go to 1,172 active AUMs. This equates to a carrying capacity of 9ac/AUM. This carrying capacity would be considered low for salt desert shrub communities, however since the allotment is meeting LHS, has no downward trends, and current livestock management was not a significant factor for the meeting with problems rating the allotment will not have active AUMs adjusted below the ecological site suggestions. The permittee has been progressively managing use areas, with periodic rest, and proper utilization rates (~35%) for most of the area, which has allowed the allotment to maintained land health standards. Utilization will stay at approximately 35%, except in areas of high concentration (i.e. fencelines, cattleguards, water developments, sheep bedgrounds, and roadsides) where utilization is expected to be higher[118]. Where changes in current grazing management could make a difference, the BLM will continue to work with the permittee to promote and manage for moving acres within the allotment from meeting with problems to meeting land health standards.

Table 53 Proposed Permit Wells Gulch

Allotment # and Name	Livestock Number/Kind	Grazing Period (MM/DD)		%PL	Type Use	Active AUMs
		Begin	End			
Wells Gulch #14016	2179/sheep	12/01	3/10	100	Active	1,172

*the grazing period is opened up to allow for flexibility, the AUMs available for use will remain unchanged.

Proposed Action - The proposed action addresses the problem of current carrying capacity (AUM's) as compared to ecological site potential, Actual Use Reports, and current and prior LHA results. In addition, it also addresses seasonal utilization targets which have been above what is suggested for improvement and maintenance of semi-desert grass lands with 8-12" of annual precipitation. It also attempts to address historical overuse by acknowledging potential multiple stable states within the State and Transition Models, which suggest once a threshold is crossed, vegetation communities may move to a new degraded stable state that are harder to recover. Laycock [14] looked at 10 years of livestock exclusion and found that it had little effect on shrub communities dominated by big sagebrush, shadscale, and Nuttall saltbush in western Colorado. This is because the vegetation could have been in a stable state, even though degraded, and some force or energy might be necessary to move the vegetation past the threshold which is preventing change. In addition, Kitchen and Hall (1996) state continued winter (dormant season) grazing with sheep at moderate levels appears to pose little threat to the stability of shrub communities within the Desert Experimental Range, and further mention spring grazing

increases the risks, but common sense suggests the effects of spring grazing might be minimized under a conservative deferred grazing system.

Summary of Proposed Action - With these adjustments in grazing management, it is anticipated no new acres will enter into a downward trend due to current livestock management. Areas where trend is static on the allotment(s), and where perennial cool season grasses, forbs, and shrubs are still a major component of the vegetation, recovery to upward trends and moving towards meeting LHS, will occur more quickly than areas lacking desired vegetation components and dominated by exotic invasive annuals. Areas dominated by exotic invasive annual may need additional inputs (herbicide treatment, seeding) to move the vegetation community from one trend category to another. Expectations in desired perennial basil cover (additional desired perennial vegetation) on the allotment will be in slow incremental steps over 25-100 years, and may only be marginally detectable in the first 10-25 years; however, trend should start to move with increased plant vigor, soil stability, treatment of exotic invasive weeds, and seeding where necessary, in addition to modifications in current grazing management.

Other disturbances from rights-of-ways, OHV and wildlife would continue to impact vegetation communities and introduce invasive annual and perennial plant species.

Alternative 2 (no grazing) - Introduction and unrestricted domestic grazing during the settlement of arid western rangelands set the path for these rangelands to cross vegetative community thresholds. A stable vegetative state is considered resilient, when that state returns to the original state after being disturbed by either natural events (fire, insects) or by management action (grazing, introduction of invasive species, developments)[14]. If the stable state does not return to the original level after disturbance it is considered to have crossed a threshold. Historically, these rangelands in the North Delta LHA unit have crossed a threshold from the original vegetation communities where salt-desert shrub ranges were estimated to have a carrying capacity of 5 acres/AUM and have transitioned to at least 18 acres/AUM[13]. These new thresholds move towards new stable states with altered vegetation characteristics as compared to associated ecological sites. Friedel[15], states once a threshold is crossed to a more degraded state, improvement won't occur on a practical time frame without much greater intervention or management effort than simply removing grazing. Kitchen and Hall[17] noted, on spring-grazed pastures it would take at least 120 years after the elimination of grazing to fully restore certain species and this process could be further hindered by increased dominance of introduced annuals. In addition, Kitchen and Hall[17] mention, continued winter (dormant season) grazing with sheep at moderate levels appears to pose little threat to the stability of shrub communities within the Desert Experimental Range and further state spring grazing increases the risks, but common sense suggests the effects of spring grazing might be minimized under a conservative deferred grazing system. With the proposed management actions targeted to stop continued degradation, improve vegetative vigor, and low cool season perennial basal cover, the allotments would slowly improve moving towards meeting Land Health Standards without total removal of livestock grazing.

Other disturbances from rights-of-ways, OHV and wildlife would continue to impact vegetation communities and introduce invasive annual and perennial plant species.

No Action Alternative (current management)- Continuation of grazing under current management would result in similar impacts as found in the 2012 land health assessment. Allotments with acres meeting land health standards would continue to do so under this action, while allotments with acres meeting with problems with static trends, would remain stable, and allotments with acres meeting with problems that have downward trends would continue to degrade, as acres not meeting standards would remain static and/or increase. This action is not in accordance with CFR §4180.1 Fundamentals of Rangeland Health. Direct and indirect impacts would be expected to continue at similar levels.

FIRE

Affected Environment

Over the past thirty years, there have been six large (>100 acres) wildfires within the North Delta LHA boundary. These fires have typically burned and carried in grasses, occasionally consuming mixed salt desert shrub, sagebrush, and a very few pinyon and juniper.

Environmental Consequences

Impacts Common to all Alternatives-The greatest impacts to changes in fire size and intensity during any given season will be attributed to seasonal weather patterns affecting the growth, continuity, and moisture of fine fuels.

Proposed Action – Grazing livestock decreases fine fuel loading and changes spatial distribution of fuels. This is likely to decrease the intensity and frequency of fires from that of a system with no grazing. Because grazing has already been established in the area, fire intensity and size under this Proposed Action will remain very similar to previous years. However, some reductions in AUMs in some allotments may allow for an increase in fine fuel loading and availability.

Alternative 2 No Grazing **–** With no grazing, fine fuel loading will increase and likely result in an increase in wildland fire intensity and size, as the fires will have a more continuous fuel source.

No Action Alternative **–** Grazing livestock have already been decreasing fine fuel loading under the current permit condition. By renewing permits as is, no immediate changes to fire intensity or size can be anticipated.

CUMULATIVE IMPACTS

Cumulative impacts are the environmental impacts that could result from the implementation of the Proposed Action, when added to the impacts from all other past, present, and reasonably foreseeable activities, regardless of who is conducting such activities. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The cumulative effects analysis considers the geographic scope of the cumulative effects and past, present, and reasonably foreseeable actions.

Analysis Area

The analysis area for each resource depends on the type of impact. The timeframes also vary due to scope of the impact and recovery times. The table below shows each resource and the impact areas.

Table 54 Cumulative Impact Resource and Impact

Resource	Cumulative Impact Analysis Area	Indicator (i.e. acres, AUMs, miles, # of sites)	Timeframe
ACEC	4 ACEC's Adobe Badlands ONA, Escalante Canyon ACEC, Native Plant Community ONA, Gunnison Gorge IBA	6,380	Depends on the resources which the ACECs were created for. For native Vegetation 25-100 years for the detectable increases in basil cover of desirable species.
Lands with Wilderness Characteristics	4 wilderness characteristics units (Adobe Badlands WSA Adjacent, Cottonwood Canyon, Dry Fork of Escalante, Dominguez Addition) and part of Camel Back WSA Adjacent	25,322 acres	The temporal scope is 10 years -- the term of the grazing permits.
Wild and Scenic Rivers	The geographic extent is the LHA unit watershed above the lower end of the eligible segment. Also included is the Hartland Dam fish passage (just downriver from the segment) and Crystal Dam, which controls river flows on the Gunnison River.	17,190 acres	The temporal scope is 10 years -- the term of the grazing permits.
Cultural Resources			

Resource	Cumulative Impact Analysis Area	Indicator (i.e. acres, AUMs, miles, # of sites)	Timeframe
Native American Religious Concerns			
Soils	North Delta Land Health Unit and the confluence of drainages from the Gunnison Gorge and Escalante LHA at the Gunnison River	181,272	25-50 years for biological soil crust recovery and perennial plant recovery.
Upland Vegetation	North Delta, Escalante,Gunnison Gorge Land Health Units	278,300	25-100 years for the detectable increases in basil cover of desirable species.
Invasive, Non-native Species	North Delta, Escalante, Gunnison Gorge Land Health Units	278,300	10-25 years depending upon inputs.
Threatened, Endangered, Sensitive Species	Salt Desert ecosystem in the North Delta, Escalante, and Gunnison Gorge LHA Units		
Migratory Birds	North Delta, Escalante, Gunnison Gorge Land Health Units	278,300	
Wildlife, Terrestrial	22 mile buffer of N Delta/Escalante/Gunn Gorge LHA. 22 miles is the average distance a bighorn (Idaho, Rocky Mountain) will travel on foray outside of their Core Herd Home Range. Pronghorn: Allotments that overlap with the CPW overall range for N Delta pronghorn herd (Alkali Flats, Deer Basin/Midway, Delta Pipeline, Petrie Mesa, Point Creek, Ward Creek/Doughspoon, Wells Gulch)		

Resource	Cumulative Impact Analysis Area	Indicator (i.e. acres, AUMs, miles, # of sites)	Timeframe
Riparian zones and Wetlands	Perennial and intermittent streams within the three LHA units.	Miles of Stream	5-25 years for riparian area recovery depending upon stream morphology.
Surface Water	Nine HUC 6 subwatersheds from the top of Grand Mesa to the outlet at the Gunnison River	181,272	25-50 years for biological soil crust recovery and perennial plant recovery.
Socio-Economics	Montrose and Delta Counties	AUMs	
Range Management	North Delta, Escalante, Gunnison Gorge Land Health Units	Number of Permits	On going

Past, Present, and Reasonably Foreseeable Future Actions (RFFA)

- Escalante permit renewal
- GGNCA permit renewal
- Continued lining of existing irrigation ditches conveying water from Federal Bureau of Reclamation irrigation water projects.
- FRAM
- Pronghorn waters

The table below summarizes all the known past, present and reasonably foreseeable future actions. The actions are listed by activity and grouped by the cumulative impact analysis area depending on the resource.

Table 55 Past, Present, and Reasonably Foreseeable Future Actions

Activities	Past Development	Present	RFFA
North Delta, Escalante, and Gunnison Gorge Land Health Areas			
BLM roads	675 miles		
County Roads (Dirt)	430 miles		
Paved County Roads and State Highways	345 miles		
Rights of Way (Power and Pipelines)	374 miles		
Rights of Way: Trans-CO pipeline, N. Delta Tri-State temporary work areas.	2,521 acres		
Area available for grazing (acres)	BLM LH Units = 278,300 acres NPS=6,739 acres State=4,141 acres Private=48,515	BLM LH Unit = 278,300 acres NPS=6,739 acres State=4,141 acres Private=48,515	BLM LH Unit = 270,885 acres* NPS=6,739 acres State=4,141 acres Private=48,515 *Proposed changes in Dominguez-Escalante RMP
Livestock Grazing	AUMs	AUMs	AUMs
Livestock Crossing Routes	132 miles	132 miles	132 miles
Irrigated Agriculture	51,719 acres	51,719 acres	51,719 acres
Irrigation Ditches	BLM=50 miles Other=350 miles		
Treatments (Contour Furrows)	1,084 acres	1,084 acres	1,084 acres
Check Dams	1,217 dams	1,217 dams	1,217 dams
Recreation Developments	13.2 acres	13.2 acres	2 OHV staging areas may be constructed; approximately 6 acres combined

Activities	Past Development	Present	RFFA
Open OHV area	1,072 acres	1,072 acres	1,072 acres
22 mile buffer around North Delta, Escalante and Gunnison Gorge Land Health Areas			
Sheep Allotments with Predicted Disease outbreaks less than 25 years	BLM=179,070 acres FS=174,342 acres Other=16,757 acres	BLM=179,070 acres FS=174,342 acres Other=16,757 acres	Same as present, but may have changes based on Dominguez-Escalante NCA RMP when finalized
Mesa, Delta, Montrose Counties			
2000 Census Population	220,963	221,012	Projected 2030: 305,441

ACEC

The cumulative impact analysis area for the ACEC is considerably smaller than the 3 land health units and contains 4 ACEC(s)/special designated units. For Cumulative Impacts, see associated Cumulative Impact Analysis sections attributed to Designation Attributes.

Table 56. ACEC Designation Attributes

LHA Unit	ACEC/ Special Designation Area[1]	Designation Attributes
N. Delta	Adobe Badlands ONA	Unique Scenic Qualities[2], Threatened and Endangered Plant Habitat (salt desert shrub), and for Sensitive Soils.
Dominguez Escalante	Escalante Canyon ACEC	Wildlife, Fish, Cultural, Geological, Natural Hazard, and Rare Plants.
Gunnison Gorge	Native Plant Community ONA	Native Plant Communities
Gunnison Gorge	Gunnison Gorge IBA	Gunnison Sage Grouse

[1]ACEC-Area of Critical Environmental Concern, ONA-Outstanding Natural Area, IBA- Important Bird Area

[2]Unique Scenic Qualities attribute were not brought forward for analysis in the EA.

Lands with Wilderness Characteristics

Recent updates to the BLM inventory of lands with wilderness characteristics show that there are four units, and part of a fifth unit, with wilderness characteristics within the three LHA units in the CIAA. All of the wilderness characteristics units were inventoried between 2010 and 2014. These units were found to possess wilderness characteristics with current grazing with grazing management in place. Continuation of grazing, and maintenance of currently existing range developments, will have no effect on the wilderness characteristics of these units.

Wild and Scenic Rivers

Existing soil disturbance from roads, rights-of-ways, treatments, recreation, and grazing continue to contribute to elevated levels of salt and selenium entering the Wild and Scenic Eligible Gunnison River Segment 2 from soil erosion during runoff events. The resulting reduction of water quality in the river negatively affects the fish ORV. As noted in the "soils" section below, the most effective means to slow erosion is perennial vegetation, and biological soil crust. But with disturbed areas within the CIAA being dominated by annual weeds, it could take over a century to reestablish perennial grasses and shrubs.

A fish passage was completed on the Hartland Dam in 2012. Prior to that, the endangered fish (ORV) could not navigate the dam structure. It is likely that this improvement to the dam is having a positive effect on the fish in relation to increased access to habitat.

The flows in this segment of the Gunnison River are largely controlled by releases from Crystal Dam, part of the larger Aspinall Unit, operated by the Bureau of Reclamation (BOR), upriver from this segment. Past operation of the unit did not favor the habitat requirements of the endangered fish, particularly spring flow requirements for spawning. In 2012 the BOR issued a Record of Decision which included provisions for operating the unit to support habitat

requirements of the endangered fish.

Changes to terms and conditions in the proposed action would result in some incremental improvements in water quality due to small improvements in soil conditions and less soil erosion. However, with the long recovery period for biological soil crusts and reestablishment of perennial grasses and shrubs, the incremental improvements are not likely to be seen in the scope of 1 ten year permit renewal period.

The reasonably foreseeable future actions include the permit renewals for two additional land health areas. Those additional areas include more eligible segments and suitable segments. Eligible segments include:

- Rose Creek; tentative classification is wild; ORV is scenic;
- Cottonwood Creek; tentative classification is scenic; ORV is vegetation;
- Dry Fork Escalante Creek, Segment 2; tentative classification is recreational; ORV is vegetation;
- Escalante Creek, Segment 1; tentative classification is scenic; ORVs are scenic, recreational, wildlife, geologic and vegetation;
- Escalante Creek, Segment 2; tentative classification is recreational; ORVs are fish, wildlife and vegetation;
- Gunnison River, Segment 3; tentative classification is recreational; ORVs are recreational, fish, cultural and vegetation; and
- Monitor Creek; tentative classification is wild; ORV is vegetation.
- More information on these segments can be found in the Eligibility Report here: http://www.blm.gov/co/st/en/fo/ufo/wild_and_scenic_river.html

Suitable segments include:

- Gunnison River within Gunnison Gorge NCA (entire river in Gunnison Gorge Wilderness to the powerline south of the confluence with the North Fork); tentative classification is wild; ORVs are cultural and historical, ecological, scenic, geological, recreational, and wildlife;
- Gunnison River within Gunnison Gorge NCA (from powerline south of the confluence with the North Fork to the Relief Ditch diversion); tentative classification is recreational; ORVs are scenic and recreational;
- Red Canyon; tentative classification is scenic; ORVs are scenic and recreational; and
- Smith Fork Creek; tentative classification is scenic; ORVs are scenic and recreational.
- More information on these segments can be found in Appendix I of the Gunnison Gorge Resource Management Plan here: http://www.blm.gov/style/medialib/blm/co/field_offices/gunnison_gorge_national.Par.70287.File.dat/GGNCA-RODRMP-Nov2004.pdf

Effects on these Wild and Scenic segments (both eligible and suitable) from the proposed action would provide slight incremental improvements to vegetation and ecological ORVs, but the effects would likely not be detectible within the ten year term of the grazing permits. Within the draft Dominguez-Escalante NCA RMP, one alternative (Alternative B) is to remove domestic sheep grazing from the NCA. This would remove 21,041 acres of domestic sheep allotments that are currently overlapping with CHHR and would be expected to have disease outbreaks on an annual basis, thus supporting the improvement of the wildlife ORV in Escalante Creek, Segment 2. There would be no effect on the other ORVs or tentative classifications of these

segments.

All eligibility/suitability determinations were made with current grazing management in place. The no action alternative would have no effect on eligibility, suitability, tentative classification or ORVs of these segments.

Soils

Existing soil disturbance from roads, rights-of-ways, treatments, recreation, and grazing continue to contribute to degradation of soil health. Bare ground associated with all of these disturbances leads to transport of soil particles through erosive processes. Once mobilized, soil is dissolved in solution and mobilized downslope dependent on the volume of water present. Rainfall-runoff events in the CIAA are typically caused by monsoonal events that are high volume but short duration. These events may erode soils, delivering them to downstream water bodies, but the impact is short duration, limiting the impact.

The most effective means to slow erosion is perennial vegetation, and biological soil crust. Large portions of the cumulative impact area consist of salt desert shrub vegetation communities. Once these sites are disturbed, exotic annual weeds dominate the site before native annual species can get reestablished. Annuals don't provide the same level of protection to prevent soil erosion. A site dominated by annuals could take 120 years, under spring grazing conditions, or longer to reestablish native perennial grasses and shrubs, and attempted mechanical restoration is not cost effective, due to the failure rates[17].

The reasonably foreseeable future actions, in addition to the proposed action, include the permit renewals for two additional land health areas. These combined actions would result in approximately 270,885 acres continuing to be grazed. Changes to terms and conditions, in each of the permits would result in some incremental improvements in soil health conditions. With a 25-50 year recovery period for biological soil crust, and 25-100 year or longer recovery period for perennial grasses and shrubs, with the cumulative impact of nearly 2000 miles of roads and rights-of-ways, the incremental improvements are not likely to be seen in the scope of 1 ten year permit renewal period.

Impacts from the proposed action would have minimal effect on either improving or degrading soil health when combined with the past, present and RFFA actions in the cumulative impact analysis area. Similarly, alternative 2 (no grazing) would have little impact on the contributions of soils eroded and delivered to the Gunnison River due to the long recovery times of soil crust and perennial plants. The no action alternative (current management) would continue to contribute soils eroded from the landscape in levels similar to those found in the existing land health assessment.

Vegetation

Large portions of the cumulative impact area consist of salt desert shrub vegetation communities. The largest common vegetation communities across the three land health units include: Pinyon Juniper with 174,325 acres (36%), salt desert shrub with approximately 166,010 acres (34%), mountain shrub with 62,109 acres (13%), and sagebrush with 60,314 acres (12%). Within the

North Delta Land Health unit pinyon/juniper communities comprises 8,927 (14%) acres, and the salt desert shrub community totals 49,209 acres (76%).

A majority of this landscape unit has concerns with Standard 3and are most pronounced in the salt desert shrub communities. The vegetation of salt desert shrub communities are characteristically sparse, with optimal ground cover 30%, and should largely be dominated by cool and warm season grasses, shrubs, in addition to annual and perennial forbs. The most concerning indicators within the 3 LHA unit include exotic invasive plants, low perennial cool season grass cover, low perennial forb cover, low native plant diversity, limited areas of low perennial warm season grass cover, low shrub vigor and cover, and heavy shrub hedging.

Based on historical information, both of these vegetation types (pinyon juniper and salt desert shrub) have altered herbaceous vegetative communities which has partly been attributed to the amount of livestock introduced into the west during settlement. During this era of unregulated heavy use period, many of these communities crossed an ecological threshold, which are difficult to recover once in a stable but degraded state[14]. In addition, Laycock[14] points out, that enclosures protected from grazing (sheep and jackrabbits) for 6-15 years did not move degraded vegetation communities to a differed vegetation condition or stage. Part of the conclusion for his observation was the amount of exotic annual vegetation present during the trials. Laycock[14] and Friedel[15]suggests, if a vegetation type is in a stable lower stable state (successional), it will not respond to simply to changes in grazing management or even the removal of grazing. They further state managers must recognize this situation when it occurs so that false expectations of improvement are not fostered.

The reasonably foreseeable future actions in addition to the proposed action include the permit renewals for two additional land health areas, and potential changes in type of livestock within the Dominguez-Escalante (D-E) NCA. These combined grazing permit renewals would result in approximately 330,280 (270,885 BLM only) acres continuing to be grazed, but would result in a slight reduction of 7,415 acres of grazing related disturbance. Changes to terms and conditions in each of the permits would result in some incremental improvements in vegetation health conditions. With a 25-100 year or longer recovery period for perennial grasses and shrubs, and the incremental improvements are not likely to be seen in the scope of 1 ten-year permit renewal period.

Impacts from the proposed action would have small incremental effect on improving degraded vegetation/ecological sites by halting any additional net degradation and improving trend over 10-25 years (downward to stable) which would move the landscape towards meeting land health standards in 25-100+ years when combined with the past, present and RFFA actions for the cumulative impact analysis area. Similarly, alternative 2 (no grazing) would have minor undetectable changes within 25-100+ years towards meeting land health standards. The no action alternative (current management) would continue to decline in levels similar to those found in the existing land health assessments.

Invasive, non-native species

Existing disturbance from roads, rights-of-ways, vegetation treatments, recreation, adjacent private land, wildlife use, and grazing continue to contribute to degradation of vegetation and

establishment of exotic invasive plants and noxious weeds. Impacts from noxious and invasive weeds in past and present actions within the CIAA include: 337, 695 acres of public lands (BLM, NPS, State, County, City and private combined); 51,719 acres of irrigated agriculture, 1,084 acres of treatments, 1,071 acres of open OHV; 2,356 miles of linear disturbance (roads, ROW [powerline/pipelines], ditches, livestock trailing routes) and 13.2 acres of recreation developments. All of these areas would correspond to vector points, establishment and persistence of invasive and noxious weeds.

The reasonably foreseeable future actions, in addition to the proposed action include the permit renewals for two additional land health areas, and potential changes in type of livestock within the Dominguez-Escalante (D-E) NCA. These combined grazing permit renewals would result in approximately 330,280 (270,885 BLM only) acres continuing to be grazed, but would result in a slight reduction of 7,415 acres of domestic grazing related disturbance. Changes to terms and conditions in each of the permits would result in some incremental improvements in desired perennial vegetation health conditions, and thus a more resilient native vegetation community. With 25-100 year or longer recovery period for perennial grasses and shrubs in areas where thresholds have been crossed, and the cumulative impact of nearly 2000 miles of roads and rights-of-ways, the incremental improvements are not likely to be seen in the scope of 1 ten-year permit renewal period.

Impacts from the proposed action would have minor incremental effect on improving desired vegetation, and by association, a vegetation community more resilient to the establishment and spread of noxious and invasive weeds, even when combined with the past, present and RFFA actions in the cumulative impact analysis area. Similarly, alternative 2 (no grazing) would have minor undetectable changes within 10-25 years towards changing trend cycles and 25-100+ years meeting land health standards. The no action alternative (current management) would continue to decline in levels similar to those found in the existing land health assessments.

Terrestrial Wildlife, including Migratory and Special Status Birds, Special Status Terrestrial Wildlife

Existing disturbance from roads, rights-of-ways, treatments, and grazing continue to contribute to degradation of vegetation and wildlife habitat health by decreasing foraging habitat and prey availability. Impacts to wildlife from past and present actions within the CIAA include 337,695 acres of domestic grazing lands (BLM, NPS, State, County, City and private combined); 51,719 acres of irrigated agriculture, 1,084 acres of treatments, 1,071 acres of open OHV, 2,356 miles of linear disturbance (roads, ROW[powerline/pipelines], ditches, livestock trailing routes) and 13.2 acres of recreation developments. All of these areas would correspond to removal or alteration of wildlife habitat and temporary (or in the case of some roads, permanent) disruption and disturbance to wildlife species, or direct impacts to individuals from vehicular collisions. These disturbances are at least partially overlapping, but grazing alone characterizes 57 % of the 589,215 acre CIAA.

Large portions of the cumulative impact area consist of salt desert shrub vegetation communities. Once these sites are disturbed, exotic annual weeds dominate the site before native annual species can get reestablished. A site dominated by annuals could take 120 years or longer to

reestablish native perennial grasses and shrubs, and attempted mechanical restoration is not cost effective due to the failure rates[17Error! Bookmark not defined.].

The reasonably foreseeable future actions, in addition to the proposed action, include the permit renewals for two additional land health areas, and potential changes in type of livestock within the Dominguez-Escalante NCA. These combined grazing permit renewals would result in approximately 330,280 (270,885 BLM only) acres continuing to be grazed, but would result in a slight reduction of 7,415 acres of grazing related disturbance. Changes to terms and conditions in each of the permits would result in some incremental improvements in vegetation health conditions and thus wildlife habitat condition. With 120 year or longer recovery period for perennial grasses and shrubs, and the cumulative impact of nearly 2000 miles of roads and rights-of-ways, the incremental improvements are not likely to be seen in the scope of 1 ten-year permit renewal period. Additionally, within the draft Dominguez-Escalante NCA RMP, one alternative (Alternative B) is to remove domestic sheep grazing from the NCA. This would remove 21,041 acres of domestic sheep allotments that are currently overlapping with CHHR and would be expected to have disease outbreaks on an annual basis.

Impacts from the proposed action would have minimal effect on either improving or degrading vegetation and terrestrial wildlife habitat health when combined with the past, present and RFFA actions in the cumulative impact analysis area. Similarly, alternative 2 (no grazing) would have minor undetectable changes within 10-50 years towards meeting land health standards. The no action alternative (current management) would continue to decline in levels similar to those found in the existing land health assessments.

Threatened, Endangered, and sensitive species Plants

Past and present actions on BLM-managed land within the CIAA area include: major utility line rights-of-way (ROW), water developments, especially check dams and irrigation projects, military training, road construction and highway expansion, livestock grazing, OHV use and other recreational activities, and illegal collection. Past and current human uses of other lands in the CIAA area include primarily agriculture, both cropland and rangeland, and industrial or residential development. Natural factors contributing to the status of the species include herbivory and trampling by wildlife. These anthropogenic and natural factors have undoubtedly contributed to changes in the distribution and abundance of the Colorado hookless cactus and altered important habitat characteristics.

The reasonably foreseeable future actions, in addition to the proposed action, include the permit renewals for two additional land health areas Escalante and Gunnison Gorge NCA. These combined actions would result in approximately 286,172 acres continuing to be grazed. Changes to terms and conditions in each of the permits could result in some incremental improvements in habitat conditions. With 25-50 year recovery period for those associated habitat that have most functional groups represented with moderate levels of invasive annual plant dominance and 120 year or longer recovery period for habitats that are more degraded. The cumulative impact of nearly 1500 miles of roads, and 2,500 acres of long term disturbed rights-of-ways, and nearly 10, 800 acres of open OHV area, the incremental improvements are not likely to be realized in the scope of 1 ten year permit renewal period.

Impacts from the proposed action would have a minimal positive impact on improving Colorado hookless cactus habitat, when combined with the past, present and RFFA actions in the cumulative impact analysis area. Alternative 2 (no grazing) would have a similar positive impact on improving Colorado hookless cactus habitat due to the long recovery times of degraded salt desert shrub communities, that the cactus is closely tied to within the CIAA. The no action alternative (current management) would have minimal negative impacts by continuing to degrade habitat for the Colorado hookless cactus at rates similar to those found in the existing land health assessment.

Wetlands and riparian zones

The cumulative impact analysis area (CIAA) for wetlands and riparian zones include perennial and intermittent streams within the 3 LHA unit, North Delta, Dominguez Escalante, and Gunnison Gorge. There are 46 total miles of stream meeting standard 2 in the CIAA area, 13 miles meeting with problems, and 4 miles that are unknown within the area. Past and present actions were noticeably similar on BLM-managed riparian and wetland within the CIAA area and include: irrigation diversions to ditches for irrigation, irrigation return flows, water developments, isolated grazing issues, ROWs which contribute sediment and other pollutants into water, and invasive and noxious weed species.

Reasonably foreseeable future action will continue to include irrigation diversions for private land irrigation. Future lining of ditches could dry up some artificial riparian areas which are due to current ditch leakage. Continued grazing, with proper management, should not create riparian issues. Continued ROWs, such as the railroad in Escalante Canyon, can initiate fires from the tracks into the riparian zone of the Gunnison River that may introduce invasive/noxious weeds.

Impacts from the proposed action would continue to have minimal effects on either improving or degrading riparian areas, within the North Delta land health unit, when combined with past, present, and reasonably foreseeable future actions in the cumulative impact analysis area. Current livestock management was not found to be a contributing factor in the degradation of riparian areas for this land health unit, and factors contributing were outside the impact of BLM management. In addition, alternative 2 (no grazing) would have little to no impact on the improvement of riparian area within this land health unit for the same reason as the proposed alternative. The current action alternative (current grazing management) impacts would be similar to the proposed action and to the findings in the existing land health assessment.

Water-Surface

The cumulative impact analysis area for surface water is slightly smaller than the three land health areas, because the actions occurring are limited to the impacts above BLM and below BLM in the upper and lower reaches of the watershed. There are 181,272 acres affected in the CIAA. The largest impact to surface water is the storage and diversion of water for irrigation on private land. Most of the natural streams above the BLM land are used to convey water to private property inholdings within BLM or at lower elevation. There are nearly 50 miles of additional irrigation ditches located on BLM land in low elevation areas to convey water to adjacent private agricultural fields. There is 51,719 acres of irrigated private land in close proximity to the CIAA.

Reasonably foreseeable future actions include the lining of existing irrigation ditches conveying water from Federal Bureau of Reclamation irrigation water projects. As described in the surface water environmental consequences section, approximately 74-87% of the salinity, and most of the selenium concentrations in the Gunnison River, are attributed to irrigation return flows, deep groundwater percolation and municipal sources. The lining of existing irrigation ditches will contribute to reduced salinity and selenium contributions by reducing the deep percolation of groundwater. Sediment and E. coli are unlikely to be impacted by lining of ditches.

Impacts from the proposed action would have minimal effect on either improving or degrading surface water quality when combined with the past, present and RFFA actions in the cumulative impact analysis area. Similarly, alternative 2 (no grazing) would have little impact on the contributions of selenium, salinity, sediment and E. coli eroded from uplands and delivered to the Gunnison River due to the long recovery times of soil crust and perennial plants. The no action alternative (current management) would continue to contribute similar levels of contaminants eroded from the landscape in levels similar to those found in the existing land health assessment.

Socio-Economics

Proposed Alternative **–** Cumulative social and economic effects experienced from reduction on any allotment would be compounded on a regional basis. As long as grazing on allotments within the planning area remains economically feasible, the cattle and farming sector will continue to provide economic activity, including jobs and income, within the study area. However, if reductions of AUMs result in the grazing on an allotment in the planning area becoming economically not feasible, then the cattle and farming sector will provide less economic activity with the study area.

Alternative 1 – Cumulative social and economic effects experienced by not renewing permits would be compounded on a regional basis. The cattle and farming sector of the regional economy would experience a decline in economic activity that exceeds the proportion of cattle and sheep inventories grazed, on public lands due to the multiplier effect.

No Action Alternative (current management) – Cumulative social and economic effects experienced with continuation of grazing under current management would result in a decline of economic activity consistent with management actions implemented to remedy continued declines rangeland health and productivity. These actions could range from a reduction in AUMs to elimination of grazing and may include land health restoration activities.

Range Management

The cumulative impact analysis area for livestock grazing management includes the three land health units North Delta, Dominguez Escalante, and Gunnison Gorge, because subsequent permit renewals may have similar effects on livestock grazing management. Livestock grazing is a dominant land use activity in these areas and incudes a total of 70 allotments and 43 grazing permits.

Past actions include the renewal of grazing permits with some modifications to Term and Conditions of the permit. However, some of these changes were never implemented due to the

way the term or condition was drafted, which made it difficult to put into grazing management practices. In addition, a variety of range improvements not limited to such improvements as cattle guards, water developments, fences, and trailing routes have been implemented across the landscape to aid in livestock management including distribution, delineation of use areas, and the management of other activities effecting livestock management.

Present actions include the renewal of grazing permit renewals with modifications to Terms and Conditions of the permit, including but not limited to, carrying capacity (AUMs), number and kind of livestock, percent public land, utilization, grazing strategies, stocking rates, and timing. In addition, a variety of range improvements such as cattle guards, water developments, fences, and trailing routes are being maintained to aid in livestock management, including but not limited to, distribution, proper utilization management, and delineation of use areas.

Reasonably foreseeable activities within the cumulative impact analysis area include livestock grazing permit renewals with modification to Terms and Conditions of the permit as listed in the above paragraphs. Grazing permit renewals are expected to maintain or improve vegetation conditions within the analysis area. There are no estimates or figures for active AUMs in other allotments at this time, but it is reasonable and foreseeable that acres/AUM would be comparable in allotments with similar ecological sites that are meeting with problems with downward trends or not meeting land health standards.

Impacts from the proposed action would have small incremental positive impacts on improving the amount of forage available on the range and in animal performance, when combined with the past, present and RFFA actions in the cumulative impact analysis area. Alternative 2 (no grazing) would have similar impacts on improving forage availability due to the long recovery times of degraded salt desert shrub communities within the CIAA. The no action alternative (current management) would continue to see degradation in rangeland condition similar to current conditions explained in the past and current land health assessments.

PERSONS / AGENCIES CONSULTED INTERDISCIPLINARY REVIEW:

The following BLM personnel have contributed to and have reviewed this environmental assessment.

Name	Title	Area of Responsibility
Jedd Sondergard	Hydrologist	Soils, Surface Water, NEPA Coordination
Melissa Siders	Wildlife Biologist	Terrestrial Wildlife, Terrestrial TES Species, Migratory Birds
Lynae Rogers	Rangeland Management Specialist	Rangeland Management, Riparian, ACEC, Vegetation, Invasive Species,
Ken Holsinger	Biologist	Threatened and Endangered Species, ACEC, Vegetation
Kelly Homstad	Fuels Specialist	Air Quality, Fire
Edd Franz	Recreation Planner	WSA, Lands w/ Wilderness Characteristics, WSR
Glade Hadden	Archaeologist	Cultural Resources, Native American Religious Concerns

APPENDIX A: DROUGHT MONITORING PLAN

Uncompahgre Field Office Drought Detection and Monitoring Plan

I. Introduction

Drought, which is a normal part of the climate for virtually all regions of the United States, is of particular concern in the West where an interruption of the region's already limited water supplies for extended periods of time can produce devastating impacts (Wilhite 1997). The Uncompahgre Field Office is located primarily within the Colorado Plateau ecoregion defined by the Western Ecology Division of the United States Environmental Protection Agency. Drought is considered to be a recurring event within this ecoregion. The early detection and prompt response to drought is needed to prevent further degradation to affected resources within the UFO. The purpose of this monitoring plan is to describe the drought indicators and response triggers that will be used to facilitate the early detection and monitoring of drought conditions, and determine if management actions are needed. This document also provides a description of the monitoring methods that will be used to determine if the drought response triggers have been met.

II. Goals

The early detection of drought is necessary for effective management during drought. The following list outlines the goals of the Uncompahgre Field Office Drought Detection and Monitoring Plan:

Goal 1: Early detection of drought conditions.

Goal 2: Verify whether regional drought conditions are reflected at the local level.

Goal 3: Strategically monitor the condition of vegetation and water resources at the local level.

Goal 4: Monitor to determine when drought conditions have ceased.

III. Drought Indicators

Drought indicators are observations signaling the start or continuation of a drought. The UFO will use the following drought indicators (A, B, C below) to determine the onset and/or continuation of a drought:

A. Regional Drought Severity Class

The UFO will use the Drought Monitor's drought severity classification and its components to indicate drought at the regional level. The National Oceanic and Atmospheric Administration and other government agencies monitor drought at national and regional levels and make this information available to the public on the U.S. Drought Monitor (http://droughtmonitor.unl.edu/). The drought severity classification breaks drought conditions into 5 stages: abnormally dry, moderate drought, severe drought, extreme drought, and exceptional drought. The US Drought Monitor is designed to

provide a general summary of current drought conditions nationwide. Drought intensity categories are based on five key indicators: Palmer Drought Index, CPC Soil Moisture Model Percentiles, USGS Weekly Streamflow Percentiles, Standardized Precipitation Index , and Objective Short and Long-term Drought Indicator Blends, together with numerous supplementary indicators. A summary of the Drought Monitor categories is as follows:

- Abnormally Dry: Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
- Moderate Drought: Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested.
- Severe Drought: soil moisture and weekly streamflows estimated in the 6-10th percentile of normal, and impacts of crop or pasture losses likely; water shortages common; water restrictions imposed.
- Extreme Drought: soil moisture and weekly streamflows estimated in the 3-5th percentile of normal, and impacts of major crop/pasture losses; widespread water shortages or restrictions.
- Exceptional Drought:, soil moisture and weekly streamflows estimated in the 0-2nd percentile of normal, and impacts of exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.

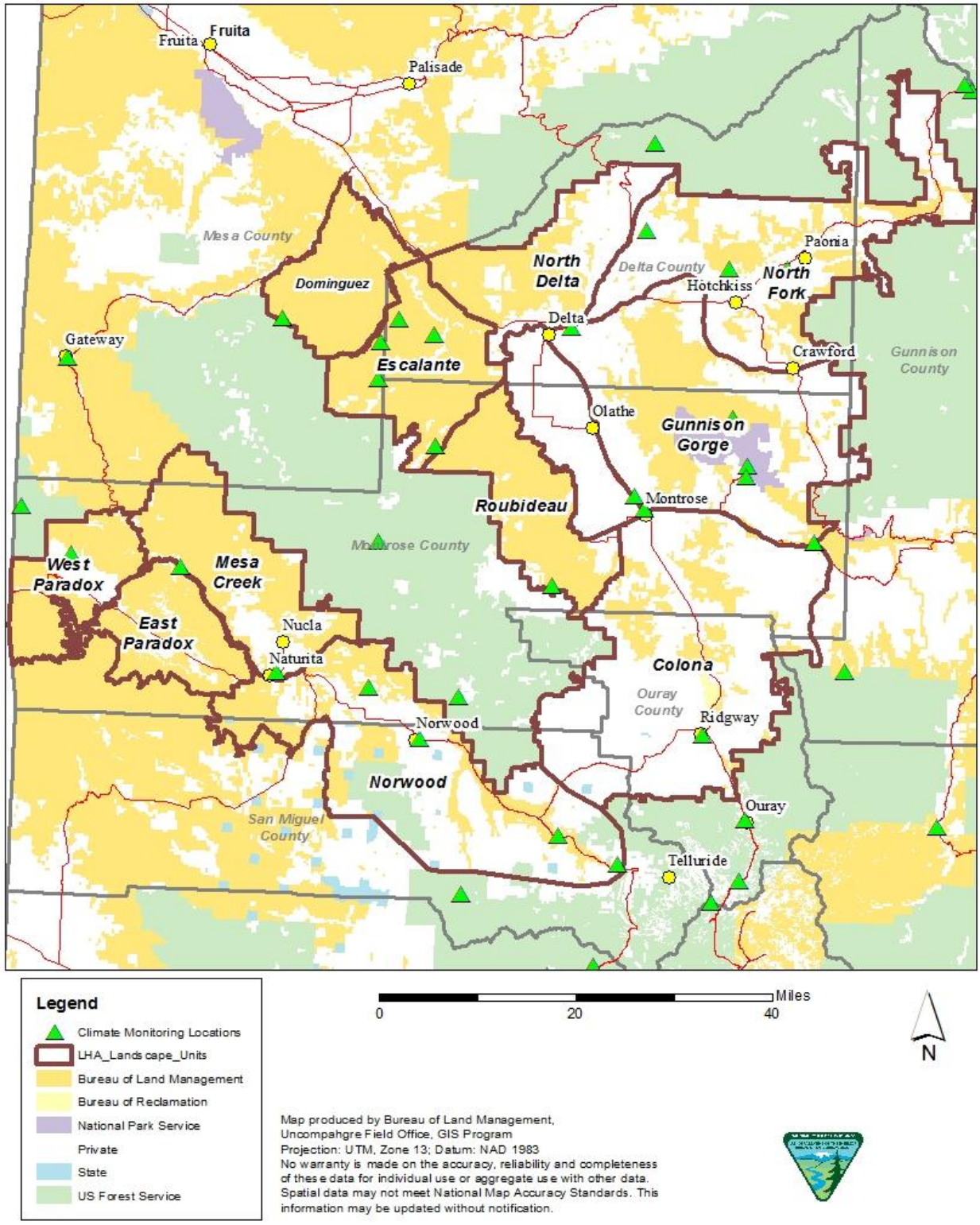
Drought Monitor information will be evaluated monthly by UFO staff.

B. Local Weather Data (temperature, precipitation, and soil moisture)

Each month, UFO staff will review monthly temperature, precipitation and soil moisture statistics from local weather sites to evaluate and classify drought status within each of the 10 landscape units, and determine whether triggers have been reached. Local weather sites include both BLM and non-BLM administered weather stations. Below are the existing weather monitoring sites within each of the 10 Landscape Health Units. (Map A1.) Additional resources that may be used to determine classification could include: Keetch-Byram Drought Index, NOAA/NESDIS satellite Vegetation Health Indices, basin snow water equivalent averages, groundwater levels, and the Surface Water Supply Index.

Where local temperature and precipitation conditions diverge from the regional-level drought severity classification, the UFO staff will reclassify the drought severity at the appropriate level for specific areas. The 10 Landscape Health Units will be used as a basis for drought severity categorization.

Map A1. Landscape Health Units across the project area.



C. Site-Level Indicators

UFO staff will make site visits to verify whether local vegetation and water availability conditions are consistent with drought categories determined from regional and local weather data. At a minimum, site visits will be conducted at a range of elevations within each Landscape Health Unit that are verified in a severe drought condition based on local weather monitoring conditions. Key forage species will be monitored based on the dominant palatable species as described in the associated Ecological Site Descriptions (ESDs) for the area. In instances where key species referenced in the ESD are absent, key species would be identified using site-specific and/or past monitoring data. The following plant production and/or drought stress indicators will be used to determine whether site-level conditions accurately reflect the Drought Severity classifications:

- Plant production: Are interruptions in plant life cycle stages (emergence, vegetative growth, flowering, seed set and dispersal, senescence) consistent with the drought severity class? Is sufficient forage available to meet Drought Management Objectives without damaging the vegetation resource?
- Drought stress: May also be monitored using VegDRI with site visits occurring to ground truth VegDRI reports. VegDRI is a hybrid drought monitoring and mapping tool that integrates satellite observations of vegetation status and climate data with information on land cover, soil characteristics, and other environmental factors. VegDRI reveals vegetation conditions as plants respond to solar energy, soil moisture, and other limiting factors (USGS 2010).
- Soil Moisture: Is sufficient soil moisture available for plant growth?
- Water availability: For those allotments which do not typically rely on water hauling for normal year use, are water sources (natural and/or developed) limited as described by the drought severity class? Are waters sufficient to provide for the management and/or distribution of wildlife and livestock while maintaining riparian area functionality and the health of adjacent upland areas?

IV. Data Management

Field worksheets, maps and drought monitoring summaries will be stored in the short/ long term monitoring files for the respective allotment. GPS points of monitoring locations will be uploaded into GIS. All GIS information will be kept to Uncompahgre Field Office and Colorado State Office standards and will be incorporated into the UFO's GIS data base.

Drought Monitoring Field Form for Livestock Use

Landscape Unit: Vegetation Type: Ecological Site:

Allotment: Occupied Sage Grouse Habitat? Yes No

UTM: Elevation

Observation Date: Observers:

Site Condition:

Meeting Land Health Standards Meeting with Problems Not Meeting

Describe:

	Date of Report	**Near Normal (1)**	**Moderate (2)**	**Severe (3)**	**Extreme (4)**
Palmer Drought Index					
VegDRI Report					
UFO local climate data (precip and temp)					

Soil Moisture (percent at site, 3", 8", 20") average 3 samples for each depth**:**

Vegetation: Evaluate 25 individuals along a paced transect for each key forage species for the ecological site type on an un-grazed site. Use dot count to tally which indicators best describe each individual for production and phenology. Rate indicators relative to what would be expected for the time of year for a normal weather pattern. Multiply dot count by midpoint of category(12.5, 38, 63, 88). Sum and divide by 25 for the average total.

Drought Indicator	Key Sp:	Key Sp:	Key Sp:
Production-select only 1			
76-100% of expected growth (1) Near Normal			
51-75% of expected growth (2)			
26-50% of expected growth (3)			
0-25% of expected growth (4) Extreme			
Average Total			
Drought Rating (1-4)			
Phenology-Evaluate 25 individuals along a paced transect. Tally w/ dot count below for each			

species.			
Delayed emergence			
Lack of flowering			
Unsuccessful seed set			
Induced senescence			
Dead			
Average Total			
Drought Rating (1-4)			

Vegetation in occupied sage grouse habitat

Evaluate 25 individuals of each key perennial plant species (grasses and forbs). Use key species whenever possible on un-grazed sites. Use dot count to tally which indicators best describe the height of each individual.

	Grass height at leaf droop	Forb height at leaf droop	Sagebrush height (vegetative stems)
Key Species			
<1 inch			
1-2 inches			
2-4 inches			
4-6 inches			
6-8 inches			
8-10 inches			
10-12 inches			
12-14 inches			
14-16+ inches			
Average Total			
Drought Rating (1-4)			

Summary - Based on the data collected, answer the following questions:

Does plant production of key species show substantial proportions of the population are experiencing life cycle impairments due to drought (e.g., drought induced senescence, reduced seed head development, etc.)?

Yes No Rational:

Has substantial death of key species occurred? Yes No

Are riparian water sources reduced to the point where livestock water needs will concentrate animals and damage riparian vegetation and impact channel stability? Yes / No / NA

Final Conclusions:

Field Verified drought severity class: Near Normal Moderate Severe Extreme

General recommendations to protect resources for Moderate, Severe and Extreme conditions:

REFERENCES

[1] BLM. 2013. Resource Management During Drought. Instruction Memorandum No. 2013-094, Bureau of Land Management, Washington DC.

[2] Ferriday, J. 2004. Base Ranch Mapping for the GMUG Region. Perpared for USDA Forest Service. Grand Mesa, Uncompahgre and Gunnison National Forests. Delta. CO.

[3] USDA, 2006. Comprehensive Evaluation Report-Grand Mesa, Uncompahgre and Gunnison National Forests, 2006. USDA-Forest Service. Delta, CO.

[4] BEA, 2003. US Department of Commerce, Bureau of Economic Analysis (BEA)-Regional Economic Accounts-Local Area Annual Estimates-Interactive Tables (NAICS,2003;SIC,1987-1997)

[5] USDA, 2002. Economics, Statistics, and Market Information System-Agriculture Census-1987-2002. United States Department of Agriculture.

[6] Holechek, J.L.and Galt, D. 2000. Grazing Intensity Guidelines. Rangelands, Vol. 22, No.3, pp.11-14.

[7] Holechek, J.L. and Galt, D. 2004. More on Stubble Height Guidelines. Rangelands, Vol. 26, pp.3-7

[8] USDI. 2001. Biological Soil Crusts: Ecology and Management. Technical Reference 1730-2. USDI Bureau of Land Management, Denver, CO. 119pp.

[9] Rosentreter, R. 1994. Displacement of rare plants by exotic grasses. In: Monsen, S.B., and S.G. Kitchen, comps. Proceedings—Ecology and Management of Annual Rangelands. General Technical Report INT-GTR-313. USDA Forest Service,Intermountain Research Station, Ogden, UT. Pages 170-175.

[10] Kaltenecker, J.H., M. Wicklow-Howard, and R. Rosentreter. 1997. Microbiotic crusts of the Lemhi Resource Area and their effect on soil-water relationships in sites recovering from long-term grazing. Unpublished report submitted to the USDI Bureau of Land Management, Salmon, ID. 58 pp.

[11] Belnap, J., Reynolds, R. L., Reheis, M. C., Phillips, S. L., Urban, F. E., and Goldstein, H. L., 2009, Sediment losses and gains across a gradient of livestock grazing and plant invasion in a cool, semi-arid grassland, Colorado Plateau, USA: Aeolian Research, v. 1, p. 27-43.

[12] USDI. 1992. Rangeland Monitoring, Statistical Consideration. Technical Reference 4400-8. USDI Bureau of Land Management, Denver, CO, pp. 74

[13] Blaisdell J.P and Holmgren R.C. 1984. Managing Intermountain Rangelands Salt-Desert Shrub Ranges. General Technical Report INT-163, Ogden UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 52p.
[14] Laycock W.A. 1991. Stable states and thresholds of range condition on North American rangelands: A viewpoint: Journal of Range management. Vol. 44, No. 5 (sept., 1991), pp427-433.
[15] Friedel, M.H. 1991. Range Condition Assessment and the Concept of Thresholds: A Viewpoint. Journal of Range Management, Vol 44, No5, pp 422-426.
[16] Holechek, J.L. et.al. 1999. Grazing Studies: What We've Learned. Rangelands, BOl. 21. No.2. pp12-16.
[17] Kitchen, S.G. and Hall, D. B. 1995. Community Stability in a Salt-Desert Shrubland Grazed by Sheep: the Desert Experimental Range Story. Barrow, J. R.McArthur, E. D.Sosebee, R. E.Tausch, R. J. Proceedings: Shrubland Ecosystem Dynamics in a Changing Environment; 1995 May 23-25; Las Cruces, NM. Gen. Tech. Rep. INT_GTR 338. Ogden, UT, U.S. Department of Agriculture Forest, Service Intermountain Research Station, INT-GTR-338
[18] USFWS. Available: http://ecos.fws.gov/ipac/ Accessed: 11/18/2014. Consultation Tracking Number: 06E24100-2015-SLI-0026
[19] Pg i-ii in CPW. 2013. Black Bear Data Analysis Unit Management Plan: Uncompahgre DAU B-17. Available: http://cpw.state.co.us/thingstodo/Pages/HerdManagementPlans.aspx Accessed 5/21/2015
[20] Pg 3 in CPW. 2011. Black Bear Data Analysis Unit Management Plan: Uncompahgre DAU B-5. Available: http://cpw.state.co.us/thingstodo/Pages/HerdManagementPlans.aspx Accessed 5/21/2015
[21] Banulis, B. pers. comm. 7 May 2015. Fawning dates for North Delta pronghorn population.
[22] Pg 339-340 *in* Wilson, D.E. and S. Ruff, eds. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington.
[23] Brad Banulis (CPW) *pers. comm.* 7 May 2015
[24] Brad Banulis, pers. comm. 1/22/2015
[25] CPW. 2013. Delta Pronghorn (A-27) Project Update as of April 11, 2013. Colorado Parks and Wildlife, Montrose, Colorado.
[26] Pg 301-302 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[27] Pg 303 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[28] Pg 2 in CPW 2013. Delta Pronghorn (A-27) Project Update as of April 11, 2013. Colorado Parks and Wildlife, Montrose, Colorado.
[29] Pg 387 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[30] Pg 520 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[31] Pg 384 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[32] Pg 524 *in* O'Gara, B. W., Yoakum, J. D., and McCabe, R. E. 2004. Pronghorn: ecology and management. Boulder: University Press of Colorado.
[33] Fitzgerald, J. P. 1996. Status and distribution of the kit fox (*Vulpes macrotis*) in western Colorado. Final Report. Colorado Division of Wildlife Project No. W-153-R-7.
[34] CPW. 2008. Kit Fox (*Vulpes macrotis*) Colorado Division of Wildlife 2007 Survey Progress Report, Southwestern Region. Montrose, CO.
[35] Link, M. A. 1995. Kit fox (*Vulpes macrotis*) distribution in western Colorado (Doctoral dissertation, University of Northern Colorado, Department of Biological Sciences, spring semester, 1995. Major advisor, James P. Fitzgerald.).
[36] Pg 54 *in* CPW. 2010. Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy.
[37] Pg 15 *in* CPW. 2010. Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy.
[38] Populations trends based on Patuxent Breeding Bird Survey Results for the Southern Rockies Region and Colorado for 1968-2012 (2000-2010), 95% CI. Accessed 11/12/2014 < http://www.mbr-pwrc.usgs.gov/bbs/reglist12.html>
[39] Boyle, S. 2012. North Delta Land Health Assessment Area Bird Point Counts 2012. BIO-Logic, Inc., Montrose, CO.
[40] USFWS. 2002, Table 16, pg 39 BCR 16 [Southern Rockies/Colorado Plateau]).
[41] CLO. 2013. All About Birds: Bird Guide. Cornell Lab of Ornithology. Available: http://www.allaboutbirds.org/guide. Accessed 11/18/2014
[42] CDOW. 2005. Unit S-62: The Uncompahgre Desert Bighorn Sheep Herd (Draft).

[43] CPW. 2013. Desert Bighorn Sheep Addendum to the Colorado Bighorn Sheep Management Plan 2009-2019.
[44] CDOW. 2009. Colorado Bighorn Sheep Management Plan: Special Report No. 81, Colorado Division of Wildlife, Denver, CO.
[45] Appendix 1 *in* CDOW 2009.[44]
[46] Besser, T. E., N. J. Anderson, K. Baker, D. L. Bruning, E. F. Cassirer, M. A. Highland, J. A. Jenks, K. Mansfield, J. M. Ramsey, J. B. Smith, and P. Wolff.. 2012a. Causes of pneumonia epizootics among bighorn sheep, western United States, 2008-2010. Emerging Infectious Diseases 18(3): 406–414.
[47] Lawrence, P. K., S. Shanthalingam, R. P. Dassanayake, R. Subramaniam, C. N. Herndon, D. P. Knowles, R. R. Rurangirwa, W. J. Foreyt, G. Wayman, A. M. Marciel, S. K. Highlander, and S. Srikumaran. 2010. Transmission of Mannheimia haemolytica from domestic sheep (*Ovis aries*) to bighorn sheep (*Ovis canadensis*): unequivocal demonstration with green fluorescent protein-tagged organisms. Journal of Wildlife Diseases 46(3): 706–717.
[48] Schommer, T.J. & Woolever, M.M. 2008. A Review of Disease Related Conflicts Between Domestic Sheep and Goats and Bighorn Sheep. General Technical Report RMRS-GTR-209. May 2008. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
[49] Besser, T. E., E. F. Cassirer, W. J. Foreyt, C. Herndon, D. P. Knowles, K. A. Potter, S. Srikumaran, and C. Yamada. 2012b. Short communications – survival of bighorn sheep (*Ovis canadensis*) commingled with domestic sheep in the absences of *Mycoplasma ovipneumoniae*. Journal of Wildlife Diseases, 48(1):168-172.
[50] Miller, M.W. & Wolf, L.W. 2011. *Pasteurellaceae* from Colorado bighorn sheep herds. Journal of Wildlife Diseases 47(3):800–804.
[51] WAFWA. 2012. Recommendations for Domestic Sheep and Goat Management *in* Wild Sheep Habitat. Wild Sheep Working Group, Western Association of Fish and Wildlife Agencies.
[52] Garde, E., S. Kutz, H. Schwantje, and A. Veitch. 2005. Examining the risk of disease transmission between wild Dall's sheep and mountain goats, and introduced domestic sheep, goats and llamas in the Northwest Territories. The Northwest Territories Agricultural Policy Framework and Environment and Natural Resources, Government of the Northwest Territories, Canada.
[53] The Wildlife Society (TWS). 2014. Impacts of disease on bighorn sheep management – fact sheet. Bethesda, MD.
[54] Cahn, M.L., M.M. Conner, O.J. Schmitz, T.R. Stephenson, J.D. Wehausen, and H.E. Johnson. 2011. Disease, population viability, and recovery of endangered Sierra Nevada bighorn sheep. Journal of Wildlife Management 75(8): 1753–1766.
[55] Foreyt, W. J. 1989. Fatal *Pasteurella haemolytica* pneumonia in bighorn sheep after direct contact with clinically normal domestic sheep. American Journal of Veterinary Research 50:341–344.
[56] O'Brien, J.M., C.S. O'Brien, C. McCarthy, and T.W. Carpenter. 2014. Incorporating foray behavior into models estimating contact risk between bighorn sheep and areas occupied by domestic sheep. Wildlife Society Bulletin: 38: 321-331.
[57] USFS. 2010. Final Supplemental Environmental Impact Statement for the Southwest Idaho Ecogroup Land and Resource Management Plans. USDA Forest Service, Intermountain Region.
[58] USFS. 2013. Bighorn Sheep Risk of Contact Tool Users Guide. Internal document. January 2013. United States Department of Agriculture, Forest Service, Intermountain Region.
[59] BLM. 2015 (Draft). Appendix K. Domestic/Bighorn Sheep Probability of Interaction Assessment. Uncompahgre Field Office, Montrose, CO.
[60] USFS. 2013. Risk of Contact Analysis between Bighorn and Domestic Sheep on the Fisher-Ivy/Goose Lake Domestic Sheep Grazing Allotment. Rio Grande National Forest, Divide Ranger District, Colorado.
[61] Singer, F. J., L. Spicer, and L. C. Zeigenfuss. 2001. Role of patch size, disease, and movement in rapid extinction of bighorn sheep. Conservation Biology 15:1347–1354.
[62] Singer, F. J., S. Bellew, M. E. Moses, and W. Sloan. 2000. Correlates to colonizations of new patches by translocated populations of bighorn sheep. Restoration Ecology 8:66–74.
[63] Banulis, B. pers. comm. 5 March 2015
[64] Banulis, B. (CPW) pers. comm. 2011
[65] Fleischner, T.L. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8(3):629-644.
[66] Jones, K.B. 1981. Effects of grazing on lizard abundance and diversity in western Arizona. Southwestern Naturalist 26:107-115.
[67] Kauffman, J.B., W.C. Krueger. 1984. Livestock Impacts on Riparian Ecosystems and Streamside Management Implications... A Review. Journal of Range Management 37 (5): 430-438.

[68] Szaro, R.C. and C.P. Pase. 1983. Short-term changes in a cottonwood-ash-willow association on a grazed and ungrazed portion of Little Ash Creek in Central Arizona. Journal of Range Management 36:382-384.
[69] Szaro,. R.C., S.C. Belfit, J.K. Aitkin and J.N. Rinne. 1985. Impact of grazing on a riparian garter snake. Pages 359-363 *in* R. R. JohnsonC, . D. Ziebell,D . R. Patton,P . F. Ffolliotta,n d F. H.Hamre, technical coordinators. Riparian ecosystems and their management: Reconciling conflicting uses. General Technical Report RM-120. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
[70] Ryder, R. A. 1980. Effects of grazing on bird habitats. DeGraf, RM, and NG Tilghman, comps., Management of Western Forests and Grasslands for Nongame Birds, USDA Forest Service, Gen. Tech. Rep. INT-86, Int. Res. Stn., Ogden, Utah, 51-66.
[71] Banulis, B. (CPW) pers. comm. 2015
[72] USFWS. 2014. List of threatened and endangered species that may occur. Consultation Tracking Number: 06E24100-2015-SLI-0026. November 18, 2014.
[73] BLM. 2015. Wildlife, fish and rare plant report for North Delta Permit Renewal, Uncompahgre Field Office. Project File for 2014-0037 EA.
[74] U.S. Fish and Wildlife Service (FWS). 2010. Recovery Outline for the Colorado hookless cactus (Sclerocactus glaucus). Colorado Ecological Services Field Office (April 2010), Grand Junction, CO. 17 pp.
[75] Heil, K.D. and J.M. Porter. 2004. Sclerocactus in Flora of North America. Online at: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=129764. Accessed Dec. 6, 2011.
[76] Bureau of Land Management, Uncompahgre Field Office (BLM). 2002. North Delta Land Health Assessment. 2001-2002. Montrose, CO. 110 pp.
[77] *Final Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386)* (DOE and DOI 2008) http://corridoreis.anl.gov/documents/docs/Energy_Corridors_final_signed_ROD_1_14_2009.pdf
[78] Bureau of Land Management, Uncompahgre Field Office (BLM). 2009b. *Sclerocactus glaucus* Monitoring Projects and Trends in the BLM Uncompahgre Field Office, 1978-2009. (Unpublished report prepared by Charlie Sharp in support of the U.S. Fish and Wildlife Service's Revision of the Species Recovery Plan, December 15, 2009.) Montrose, CO. 13
[79] Clark, T.O. and D.J. Clark. 2007. Sclerocactus wrightiae monitoring in Capitol Reef National Park. (Unpublished report submitted to Capitol Reef National Park, Nov. 1, 2007.) Torrey, UT. 23 pp.
[80] Bernstein, E. J., Albano, C. M., Sisk, T. D., Crews, T. E. and Rosenstock, S. (2014), Establishing Cool-Season Grasses on a Degraded Arid Rangeland of the Colorado Plateau. Restoration Ecology, 22: 57–64. doi: 10.1111/rec.12023
[81] Jauni, M., Gripenberg, S. and Ramula, S. (2015), Non-native plant species benefit from disturbance: a meta-analysis. Oikos, 124: 122–129. doi: 10.1111/oik.01416
[82] Ren, H, Yang, L, Liu, N (2008) Nurse plant theory and its application in ecological restoration in lower subtropics of China. Prog Nat Sci 18: pp. 137-142
[83] Bureau of Land Management, Uncompahgre Field Office (BLM). 2010a. Escalante Land Health Assessment. 2009-2010. Montrose, CO. 47 pp.
[84] Bureau of Land Management, Uncompahgre Field Office (BLM). 2014. North Delta Health Assessment. 2014. Montrose, CO. 54 pp.
[85] Kitchen, Stanley G.; Derek B. Hall, 1996, Community Stability in a Salt-Desert Shrubland Grazed by Sheep: the Desert Experimental Range Story General Technical Report Intermountain Research Station, USDA Forest Service (INT-GTR-338): 102-107
[86] DeYoung, C. 2012a. Personal communication from Carla De Young (BLM) to Collin Ewing (BLM) regarding Colorado hookless cactus monitoring conducted by CRVFO..
[87] Programmatic Biological Assessment Effects to Listed Plant Species from the Bureau of Land Management Livestock Grazing Program: Colorado hookless cactus (Sclerocactus glaucus) Clay-loving wild buckwheat (Eriogonum pelinophilum) Debeque phacelia (Phacelia submutica). May 8, 2012. 117 pp.
[88] U.S. Fish and Wildlfie Service (FWS). 2012. Biological Opinion for Livestock Grazing Program Effects on Three Listed Plants in the Bureau of Land Management Grand Junction, Colorado River Valley, and Uncompahgre Field Office November 15, 2012. 66 pp.
[89] U.S. Fish and Wildlife Service. 2002a. Colorado pikeminnow (Ptychocheilus lucius) Recovery Goals: amendment and supplement to the Colorado Squawfish Recovery Plan. U.S. Fish and Wildlife Service, Mountain Prairie Region (6), Denver, Colorado.

[90] Hamilton, S.J., and R.H. Wiedmeyer. 1990. Bioaccumulation of a mixture of boron, molybdenum, and selenium in Chinook salmon. Transactions of the American Fisheries Society 119:500-510.

[91] Stephens, D.W., B. Waddell, and J.B. Miller. 1992. Detailed study of selenium and selected elements in water, bottom sediment, and biota associated with irrigation drainage in the middle Green River Basin, Utah, 1988-90. U.S. Geological Survey Water Resources Invest. Report No. 92-4084.

[92] Hamilton, S.J., and B. Waddell. 1994. Selenium in eggs and milt of razorback sucker (Xyrauchen texanus) in the middle Green River, Utah. Archives of Environmental Contamination and Toxicology 27:195-201.

[93] Hamilton, S.J., K.J. Buhl, F.A. Bullard, and S.F. McDonald. 1996. Evaluation of toxicity to larval razorback sucker of selenium-laden food organisms from Ouray NWR on the Green River, Utah. National Biological Survey, Yankton, South Dakota. Final Report to Recovery Implementation Program for the Endangered Fishes of the Upper Colorado River Basin, Denver, Colorado. 79 pp.

[94] Stephens, D.W., and B. Waddell. 1998. Selenium sources and effects on biota in the Green River Basin of Wyoming, Colorado, Utah, in Frankenberger, W.T., Jr., and Engberg. R.A., eds., Environmental chemistry of selenium: New York, Marcel Dekker, p. 183-204.

[95] Osmundson, B.C., T.W. May, and D.B. Osmundson. 2000. Selenium concentrations in the Colorado pikeminnow (Ptychocheilus lucius): Relationship with flows in the upper Colorado River. Arch. Environ. Contam. Toxicol. 38:479-485.

[96] Richards, R.J., Linard, J.I., and Hobza, C.M., 2014, Characterization of salinity loads and selenium loads in the Smith Fork Creek region of the Lower Gunnison River Basin, western Colorado, 2008–2009: U.S. Geological Survey Scientific Investigations Report 2014–5101, 34 p., http://dx.doi.org/10.3133/sir20145101.

[97] Bryce, S.A., et. al., 2012. Colorado Plateau Rapid Ecoregional Assessment Report. Prepared for the US Department of Interior, Bureau of Land management, Denver, Colorado.

[98] Platts, W.S.1986. Riparian Stream Management. Transactions of the Western Section of the Wildlife Society 22 (1986): 90-93.

[99] Clary, W.P., and Webster, B.F. 1989. Manageing grazing of riparian areas in the Intermountain Region. US Department of Agriculture, Forest Se5rvice, Intermountain Research Station, 1989.

[100] Lemly, A.D., 2002, Selenium assessment in aquatic ecosystems—A guide for hazard evaluation and water quality criteria: New York, Springer-Verlag, 161 p.

[101] Leib, K.J., and Bauch, N.J., 2008, Salinity trends in the Upper Colorado River Basin upstream from the Grand Valley Salinity Control Unit, Colorado, 1986–2003: U.S. Geological Survey Scientific Investigations Report 2007–5288, 21 p.

[102] Ferguson, C., de Roda Husman, A.M., Altavilla, N., Deere, D., Ashbolt, N., 2003. Fate and transport of surface water pathogens in watersheds. Crit. Rev. Environ Sci. Techn. 33, 299–361.

[103] Schaffrath, K.R., 2012, Surface-water salinity in the Gunnison River Basin, Colorado, water years 1989 through 2007: U.S. Geological Survey Scientific Investigations Report 2012–5128, 47 p.

[104] Mast, M.A., Mills, T.J., Paschke, S.S., Keith, G., Linard, J.I., 2014, Mobilization of selenium from the Mancos Shale and associated soils in the lower Uncompahgre River Basin, Colorado. Applied Geochemistry 48 (2014) 16-27 pp.

[105] Richards, R.J., Linard, J.I., and Hobza, C.M., 2014, Characterization of salinity loads and selenium loads in the Smith Fork Creek region of the Lower Gunnison River Basin, western Colorado, 2008–2009: U.S. Geological Survey Scientific Investigations Report 2014–5101, 34 p., *http://dx.doi.org/10.3133/sir20145101*.

[106] Mayo, J.W., and Leib, K.J., 2012, Flow-adjusted trends in dissolved selenium load and concentration in the Gunnison and Colorado Rivers near Grand Junction, Colorado, water years 1986–2008: U.S. Geological Survey Scientific Investigations Report 2012–5088, 33 p.

[107] McAda, C.W., 2003, Flow recommendations to benefit endangered fishes in the Colorado and Gunnison Rivers (Final Report): Grand Junction, Colo., Upper Colorado River Endangered Fish Recovery Program Project Number 54, 237 p., at *http://www.usbr.gov/uc/wcao/rm/aspeis/pdfs/GunnCoFlowRec.pdf*.

[108] Williams, C.A., Schaffrath, K.R., Elliott, J.G., and Richards, R.J., 2013, Application of sediment characteristics and transport conditions to resource management in selected main-stem reaches of the Upper Colorado River, Colorado and Utah, 1965–2007: U.S. Geological Survey Scientific Investigations Report 2012–5195, 82 p.

[109] Pachepsky, Ya.A., A.M. Sadeghi, S.A. Bradford, D.R. Shelton, A.K. Guber, and T.H. Dao. 2006. Transport and fate of manure-borne pathogens: Modeling perspective. Agric. Water Manage. 86:81–92.

[110] Belnap and Eldridge, 2001. Biological Soil Crusts: Structure, Function and Management. Ecological Studies,

Vol. 150. Springer-Verlag Berlin Heidelberg 2001.

[111] Richards, R.J., Linard, J.I., and Hobza, C.M., 2014, Characterization of salinity loads and selenium loads in the Smith Fork Creek region of the Lower Gunnison River Basin, western Colorado, 2008–2009: U.S. Geological Survey Scientific Investigations Report 2014–5101, 34 p., *http://dx.doi.org/10.3133/sir20145101*.

[112] BEA 2013. Bureau of Economic Analysis, Regional Data CA4 and CA5N Tables 2013

[113]USDA 2013. National Agricultural Statistics Service, 2013 Agricultural Statistics Annual.

[114] USDA 2015. National Agricultural Statistics Service, Quick Stats Census Data http://quickstats.nass.usda.gov/

[115] BLM 2015. BLM New Release, "BLM and Forest Service Announce 2015 Grazing Fee"

[116] Colorado 2014. State Board of Land Commissioners, "RE: Changes to Standard Grazing Rates Effective April 1, 2014"

[117] IMPLAN 2012. Impacts Analysis for Planning, IMPLAN Colorado Database 2012

[118] Holechek J.L., Pieper R.D., and Herbel, C.H. 1989. Range Management Principles and Practices.